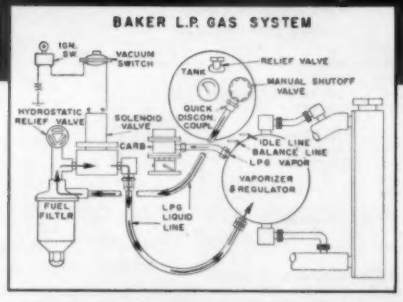
BAKER *offers LP gas fork trucks in 2000 to 7000 lb. capacities*



Arrows trace the flow of LP gas from the tank through the filter to the vaporizer and regulator before it enters the engine. The hydrostatic relief valve opens the system before dangerous pressure is reached in event of high ambient temperature changes. Automatic fuel shut-off is provided by solenoid valve and vacuum switches when engine stops. For maximum efficiency, the vaporizer preheats the LP gas before it passes to the regulator and the regulator reduces the pressure before the gas enters the carburetor.

The complete Baker line includes the BAKER LP gas fork trucks for those desiring the cost savings, cleaner operation, and other advantages provided by liquefied petroleum gas.

The Baker LP gas truck is powered by an engine specially designed for LP gas, not just a conversion unit. The special LP engine is provided with high compression head for maximum efficiency. Among the features are a special cold manifold and hot thermostat for cooler operation. Stellite-faced exhaust valves and solid Stellite inserts assure greater dependability and longer life. Complete vaporization and more efficient combustion mean lower oil consumption, less down time and reduced maintenance costs due to minimum cylinder wear. Fuel tank conveniently located behind the driver can be removed and full tank installed in less than a minute.

Write for information.

Baker industrial trucks

THE BAKER-RAULANG COMPANY

1251 WEST 80th STREET • CLEVELAND 2, OHIO

A Subsidiary of Otis Elevator Company

Otis 6G4

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Facts About Silicone Rubber

WHAT IS silicone rubber? Information about this elastomer as to its chemistry, properties and application and fabrication possibilities are available in booklet form.

This 48-page booklet, entitled "1957 . . . Silicone Rubber" contains three papers given by chemists of The Connecticut Hard Rubber Co. The first paper goes into the chemical reasons behind silicone rubber's versatility. The second paper discusses specific properties available in different compounds, and the third paper describes what consideration must be given to the fabrication techniques used in producing silicone rubber parts.

This booklet is available in the United States only at a price of $1.00 per copy directly from The Connecticut Hard Rubber Co., 407 East Street, New Haven 9, Conn.

Industrial Painting Refresher

NORTH DAKOTA STATE COLLEGE, Department of Paints, Varnishes and Lacquers, will present a six-day short course on Maintenance Coatings. The course will be conducted from August 5 to the 10th. It will be directed by Dr. Wouter Bosch who has had 12 years of industrial paint experience.

Some of the subjects which will be discussed at this course are: Paint types and where to use them; Modern surface preparation to meet today's industrial needs; Modern coatings applications to meet today's industrial needs; General maintenance painting; A researcher's view of protective coatings for maintenance; Practical spray painting; Use of paint rollers; and Specialty maintenance coatings.

More information about this Maintenance Coatings Short Course may be obtained by writing to Dr. Wouter Bosch, North Dakota State College, Department of Paints, Varnishes and Lacquers, Fargo, North Dakota.

Sharpen Your Garden Tools

PLANT ENGINEERS with the "green thumb" touch will want to submit information on their industrial landscaping efforts for a "Plant America" award.

This is the fifth year that the Industrial Landscaping Awards for American Industry will be presented. It is sponsored by the American Association of Nurserymen.

Competition for the 1958 awards ends September 1, 1957, and is based on photographic evidence of outstanding landscaping.

A folder describing the requirements for submitting your consideration may be obtained by writing to the American Association of Nurserymen, 10 E. 43rd St., New York 17, N. Y.

Chief Plant Engineer Urbanski

Mitchell R. Urbanski has been appointed chief plant engineer for Fansteel Metallurgical Corporation's new tantalum - columbium plant now being constructed near Muskogee, Oklahoma.

He has been in the plant engineering department in the main Fansteel plant at North Chicago for the past nine years. He is a graduate mechanical engineer from the University of Wisconsin, 1942, and is a member of the Northern Illinois Chapter of the American Institute of Plant Engineers.

Report on Evaporative Coolers In Desert Areas

EVAPORATED COOLING can provide effective and inexpensive air cooling in certain climatic areas, but only with proper design and well-defined maintenance procedures.

Inferior performance of equipment at some of its desert bases led the U. S. Navy to investigate design, operation and maintenance of evaporative coolers. Since limited information could be found on design, tests were devised for evaluation of efficiencies and characteristics of cooler components.

The report contains recommendations for simple, effective low cost evaporative systems based on results of field studies and in-service tests of climatic requirements, water requirements, sizing equipment, equipment selection and maintenance procedures.

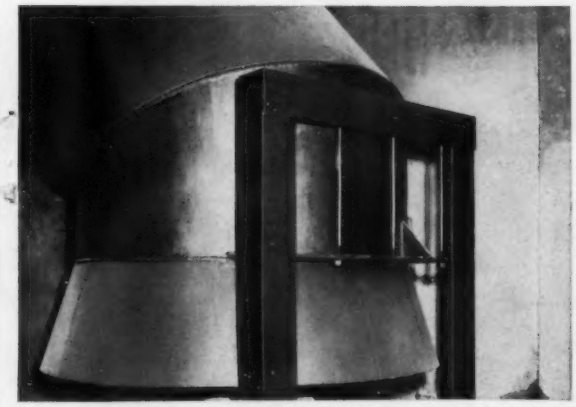
Among other conclusions, it was found that rotary-type coolers are best for permanent buildings and drip-type for temporary installations. The specific heat load method is most reliable for determining equipment size. A water bleed-off system is essential for control of mineral scale deposits.

The illustrated report, PB 111712 "The Military Application of Evaporating

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.

Welder applies the finishing touch to a section of corrosion resistant wrought iron duct slated for shipment to the Orlando Utilities Commission's municipal power plant.

Wrought Iron provides rugged opposition to corrosion in Orlando, Florida's municipal power plant



This wrought iron surge well outlet presents a formidable defense against corrosion and fatigue stresses at the Orlando powerhouse.

Three hundred sixty tons of durable wrought iron help minimize the threat of corrosion at the Orlando Utilities Commission's municipal power plant.

Here, ducts, tanks, pipe and stack installations of wrought iron are successfully withstanding corrosion. Result is low-cost corrosion control . . . virtually no maintenance or repairs. This material actually pays for itself in years of service rendered.

Reasons why wrought iron brings such permanence to plant facilities appear in our booklet, *The ABC's of Wrought Iron*. Write for your copy. A. M. Byers Company, Clark Building, Pittsburgh 22, Pennsylvania.

Available in Canada and throughout the world

Architects and Engineers: Robert & Co., Associates, Atlanta, Georgia
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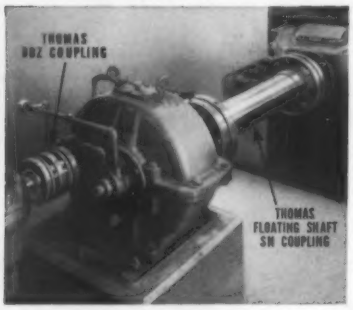
FLEXIBLE COUPLINGS
Give You Freedom From Coupling Maintenance



NO LUBRICATION

NO MAINTENANCE

NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.

They will protect your equipment and extend the life of your machines.

Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

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'ROUND ABOUT

Cooling," by R. F. Law and W. R. Nehlsen, U. S. Naval Civil Engineering Research and Evaluation Laboratory, may be ordered from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Price of this 29-page report is 75 cents.

Plant Engineering Did It Again

THE EDITORIAL STAFF of PLANT ENGINEERING is pleased to hear that the magazine has been voted a National Safety Council Public Interest Award for 1956. This non-competitive award is made annually to public information media for exceptional service to safety.

Instrumentation Contest

IF YOU HAVE developed any new ideas on instrumentation, you may be interested in taking part in the yearly contest of the Instrument Society of America. Awards will be presented at the Instrument-Automation Conference and Exhibit to be held in Cleveland, from September 9 to the 13th.

Contest awards last year were in the areas of processing, data handling, aeronautical and medical-biological activities. However, contestants are not limited and should consider the entire field of instrumentation and automatic control. Recognized authorities will judge the entries based on practicability, adaptability and originality. Cash prizes and award certificates will be given to the winners.

Entry blanks for the "New Ideas in Instrumentation Contest" may be obtained from H. S. Kindler, Director of Technical Programs, Instrument Society of America, 313 Sixth Avenue, Pittsburgh 22, Pennsylvania.

On Writing Building Specs

SPECIFICATIONS WORKSHOP, attended by 60 representatives of professional, technical, trade and manufacturing groups, enumerated industry-wide problems of writing specifications to improve quality and workmanship in buildings.

Working as two groups, one on architectural specifications and the other on electrical-mechanical specifications, the workshop made such recommendations as to the scope of work of the designer and how to control the quality of materials and equipment going into the buildings.

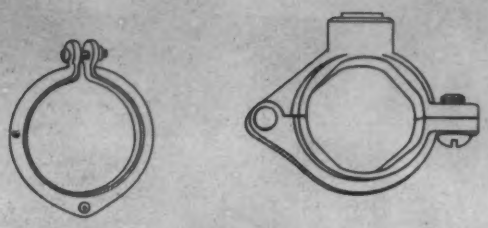
Some of the subjects discussed at this workshop were: training courses for writing specifications, the relationship of specifications and drawings, sequence of preparation, location of excavation items, responsibility for on-the-job damage, catch-all provisions, amendments and addenda, separate contracts, location of sleeves and openings and the coordination of space for installation of electrical and mechanical facilities.

A full report of this meeting is available from the Building Research Institute, 2101 Constitution Ave., Washington 25, D. C.

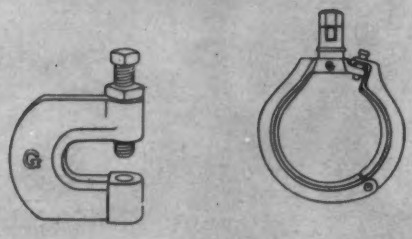
Maintenance Engineer Tests Portable Welding Gun

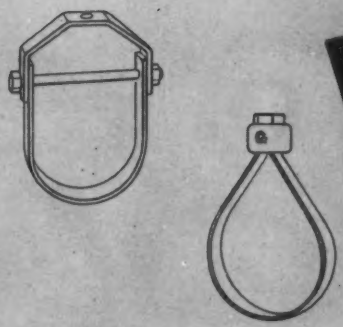
A. H. Clark, Detroit Edison Maintenance Engineer, tries out Allis-Chalmers new condenser tube welding technique and special welding gun at the company's West Allis Works. Watching are, left to right: R. A. Wilson, W. B. Lee (rear) both of Allis-Chalmers; P. E. Landback, (front) Mechanical Equipment Engineer of Detroit Edison; O. A. Haas, Allis-Chalmers; K. W. Hartwell, Supervisor, Mechanical Buying, and Frank Lewis, Supt. of Maint., both of Detroit Edison; and L. Zoladkiewicz, Allis-Chalmers. Gun fuses surface condenser tubes to sheets

Easy to ship, store, and handle!



GRINNELL packaged PIPE HANGERS





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- **Simplified storage and shipping**
- **Faster, cleaner handling**
- **Quick identification by labels**
- **Greater accuracy in filling orders**
- **Convenient handling on the job**

Contact your nearby Grinnell warehouse, or see your local distributor.

Now, a wide selection of Grinnell Pipe Hangers comes to you in new, convenient, easy-to-handle packages that require a minimum of shelf space. Available in master containers — each of which holds from two to twelve smaller, individual cartons — Grinnell Hangers stay in perfect condition on the job, free from dirt and damage, ready for immediate use. Labels quickly identify contents . . . assure right quantity of the right hanger . . . make order filling simpler, more accurate.

Order Grinnell *Packaged* Pipe Hangers. Take advantage, too, of Grinnell's expert knowledge gained during more than 100 years of service in the piping field.

GRINNELL
AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

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pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
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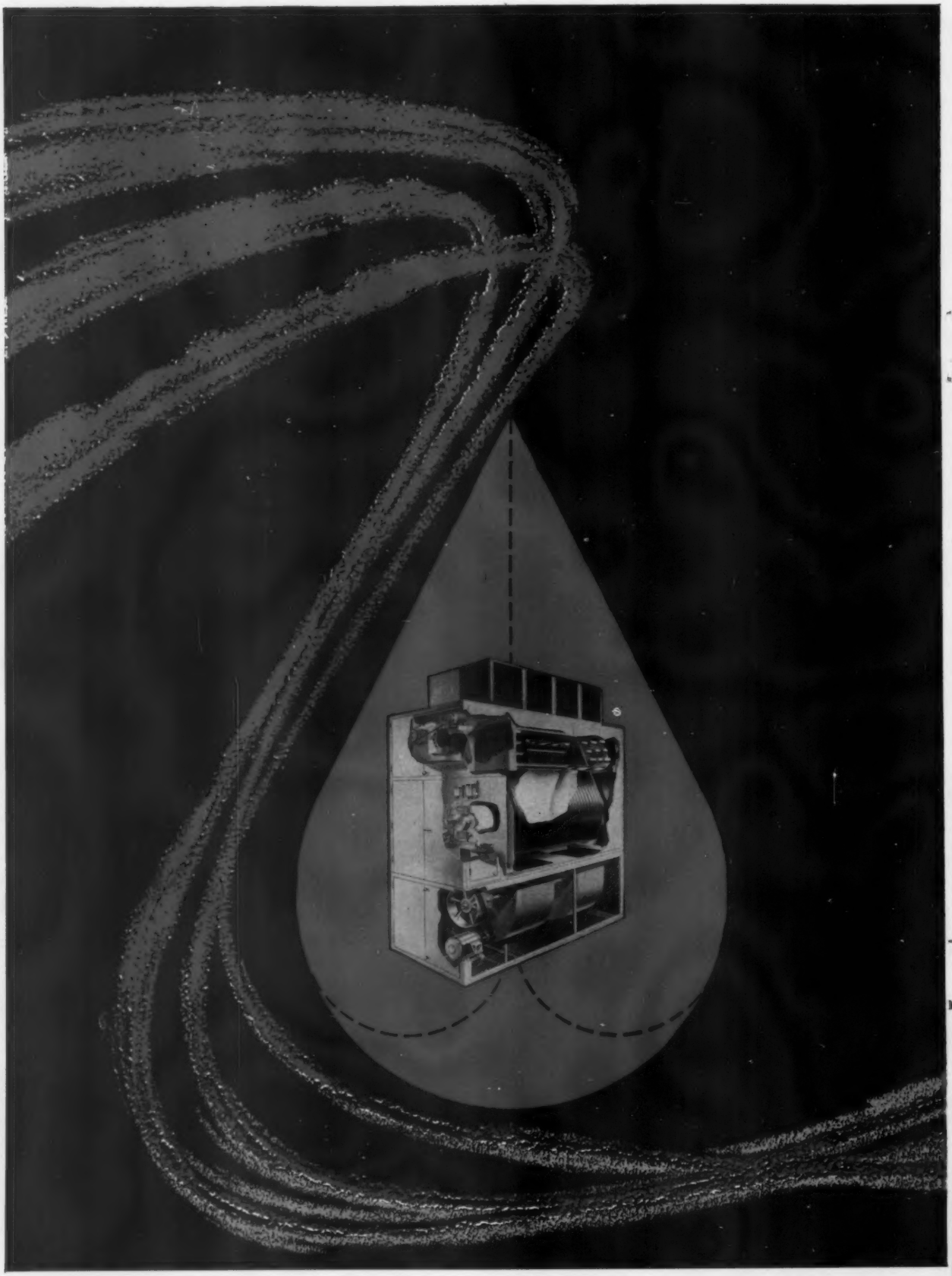

new Dravo heater
speeds air flow with

high-efficiency airfoil combustion chamber

Based on aerodynamic principles, the stainless steel combustion chamber of the all-new Dravo *Counterflo* heater is a true airfoil shape. Dravo's research team took two airplane wing sections and placed them back-to-back. The result is a shape that permits maximum air flow with minimum resistance. Every square inch of the chamber is "wiped" by the air stream, and faster, more efficient heat transfer is accomplished. The new Dravo combustion chamber brings you these exclusive features:

- True airfoil design
- Larger sizes ribbed for greater strength . . . channeling of air flow
- Stainless steel construction . . . guaranteed for 10 years
- Aluminized steel economizer tubes for corrosion resistance . . . guaranteed life
- Four-pass flame travel for maximum heat transfer

The combustion chamber is an important part of the *unitized* design of the all-new Dravo *Counterflo* heater. New induced draft firing, revolutionary PYROJET burner, low-speed fans deliver high velocity airflow through new discharge plenum . . . all combine to make the new Dravo *Counterflo* a remarkably efficient and economical heater.

Write for full information on this remarkable new Dravo heater. There is a size and type for every heater application—for economical space heating—for process drying—for tempering make-up air, as a duct furnace for combination heating, air conditioning and for a host of other applications. Address Dravo Corporation, Pittsburgh 22, Pennsylvania.

Ask for Bulletin 564-36

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Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

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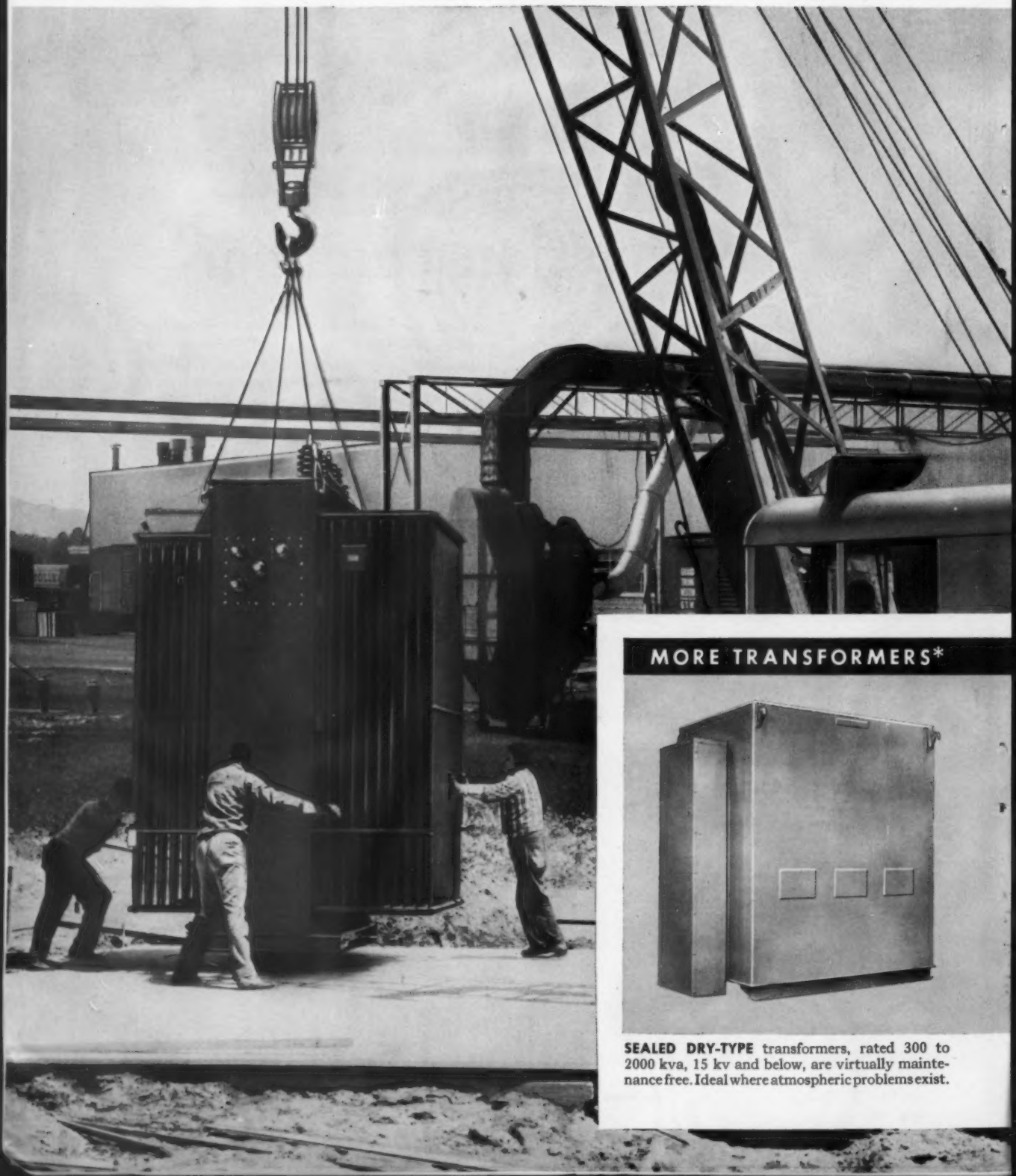

MORE TRANSFORMERS*

SEALED DRY-TYPE transformers, rated 300 to 2000 kva, 15 kv and below, are virtually maintenance free. Ideal where atmospheric problems exist.

General Electric RM medium transformers

If your new or modernized plant power system calls for transformers in the range of 501 to 7500 kva, 69 kv and below, you'll benefit from faster, easier installation of General Electric RM medium transformers. The average installation time of these units is only four hours from delivery at the installation site.

RM medium transformers are shipped completely assembled, eliminating the time required for installation of bushings and other accessories which are often shipped separately, in the field. Additional installation time is saved by such outstanding General Electric features as ski-tip bases, extra jacking space, and reversible junction boxes.

MORE RM MEDIUM TRANSFORMER BENEFITS:

Easier installation is only one of the outstanding benefits you'll receive. Here are more:

Shorter shipment—standardization of design and General Electric's repetitive manufacture process cut shipping time to 10 weeks. Voltage ratings and optional features available make these standard units ideal for most industrial applications.

Reduced maintenance, longer life—control-center arrangement of instruments, full drain feature and many others help minimize routine inspection time. Quality materials, plus continuous quality control during manufacture, assure greater reliability on the job.

Before you buy a medium transformer, contact your nearest General Electric Apparatus Sales Office. You'll discover how faster shipment, easier installation, reduced maintenance, and longer life add up to more for your transformer dollar. General Electric Company, Schenectady 5, New York. 416-13

Progress Is Our Most Important Product

GENERAL ELECTRIC

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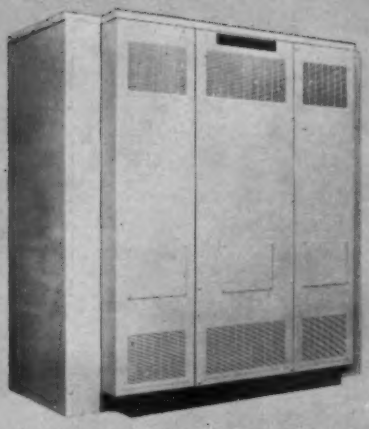


OPEN DRY-TYPE transformers, rated 300 to 2000 kva, 15 kv and below, are used in clean, dry, indoor locations where weight or floor space present problems. Light enough to mount overhead!

LIQUID-FILLED transformers, rated 112½ to 500 kva, 15 kv and below, conveniently and economically supply small blocks of power. Outdoor units are oil filled; indoor, Pyranol† filled.

*** These same transformers are also incorporated in General Electric's outstanding line of load-center and distribution-center unit substations.**

† Reg. Trade-mark of General Electric Company.

For more facts circle 507 on Reply Card

1 Package 1 Shipment

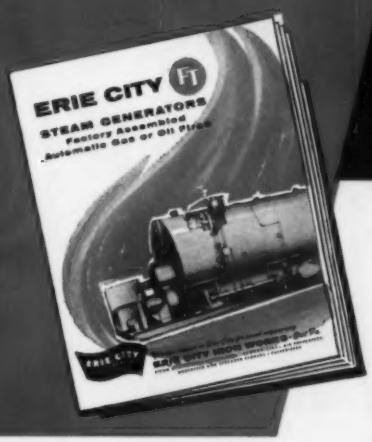
That's FT by ERIE CITY

● A truly modern conception of the boiler-burner-control package fire tube steam generator. Manufactured, assembled, wired, piped, and factory fire tested—ready to go to work when it reaches your plant.

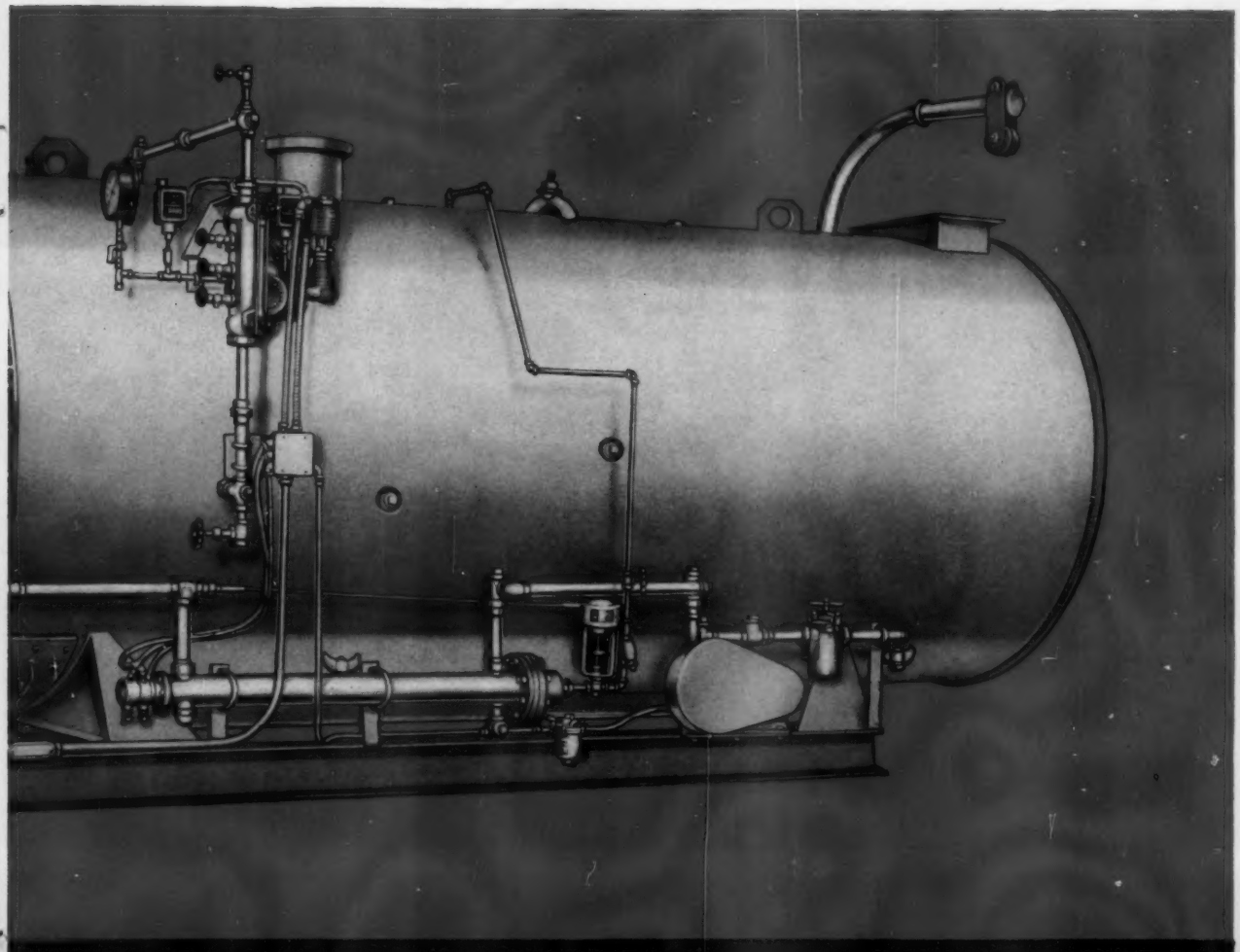
Behind this Erie City package unit is the manufacturing skill and engineering know-how acquired through more than a century of producing large, high pressure, water tube and fire tube industrial power boilers.

The FT is conservatively designed, having five full square feet of heating surface per developed horsepower. Peak ratings are easily attainable with no undue strain on the boiler and its attendant high maintenance costs.

For a complete description of the FT write for Bulletin SB-569F.



1 Responsibility



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117 Years in Steam Generation

ERIE CITY IRON WORKS • *Erie, Pa.*

STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS
UNDERFEED AND SPREADER STOKERS • PULVERIZERS

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Laboratory...

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Wipe better at less cost

KIMWIPES Industrial Wipers save over cloth, eliminate laundry charges, rag collecting, counting and material losses. Soft, disposable Kimwipes save production time. They wipe clean faster, dry or soaked with solvents!

You can often reuse a Kimwipe, too. When the job calls for a clean wiper, reach for a fresh Kimwipe—dispensed pop-up fashion just like Kleenex tissues! For your convenience . . . in pop-up dispensing cartons or metal wall dispensers.

Kimwipes are made by the makers of Kleenex* tissues

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use **Kimwipes***

INDUSTRIAL WIPERS

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*T. M. Reg. U. S. Pat. Off.

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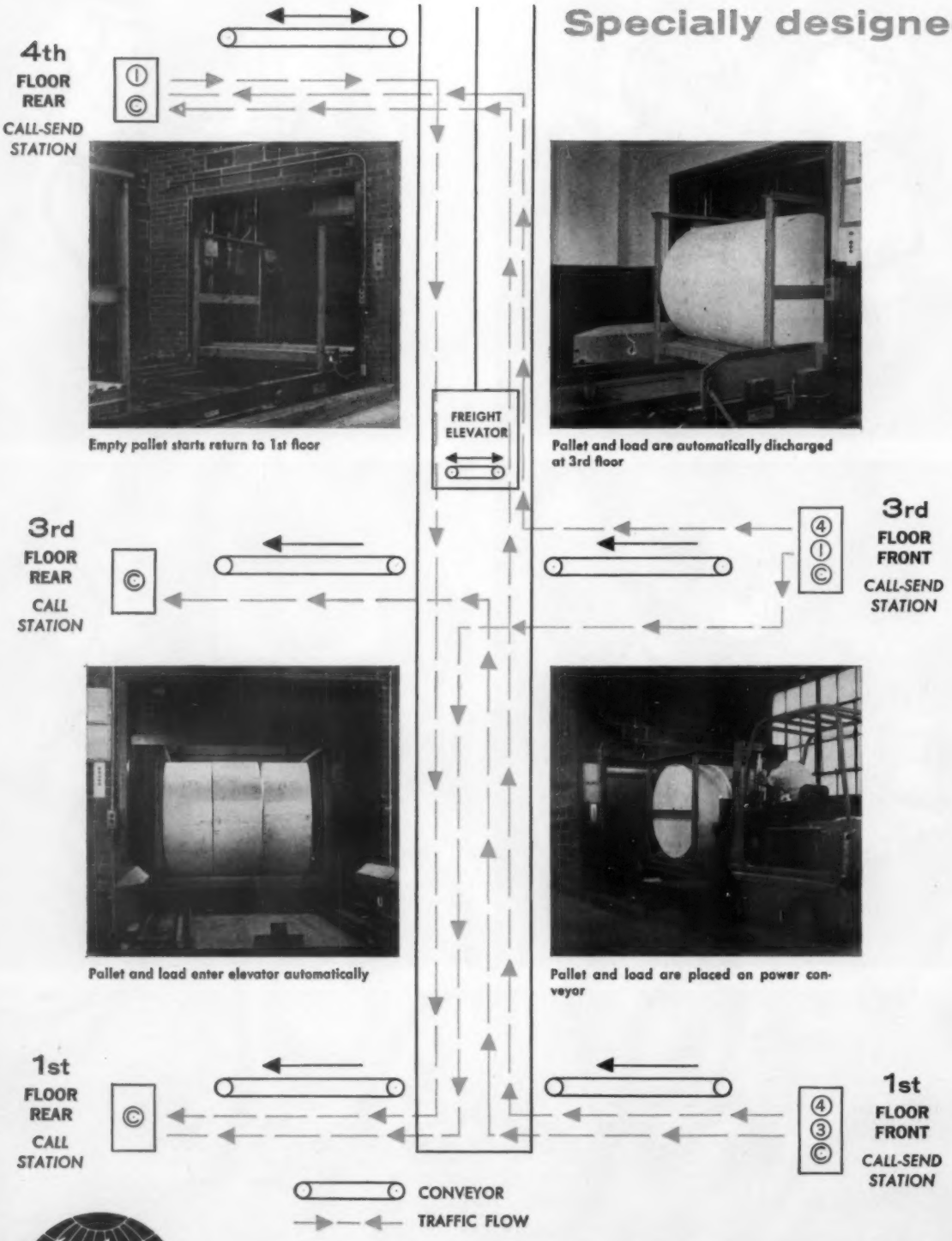

Otis freight elevator

"ENGINEERED SERVICE BY THE MAKER"

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N. Y.

'Call-and-Send' system handles multi-floor freight automatically

OTIS and the Alvey Conveyor Company developed the special materials handling system illustrated and explained at the left. Power-operated conveyors serve as the elevator platform and the floor landings. Light-ray devices coordinate freight movement and elevator door operation.

This 'Call-and-Send' system was developed for the INDIVIDUAL DRINKING CUP COMPANY, a subsidiary of Dixie Cup Company in Easton, Penna.

OTIS is very much interested in helping to develop automatic materials handling systems.

Further, OTIS is able to assure the uninterrupted operation of these systems by providing OTIS Maintenance. The elevators in the 'Call-and-Send' system, five other freight elevators and one passenger elevator, all by OTIS, have been under OTIS Maintenance for a total of 60 years and are still operating at their original efficiency. The life of these elevators is being constantly extended indefinitely by checking and replacing all wearing parts in advance of their breakdown point. This prevents production losses. With OTIS Maintenance there's just one fixed monthly charge. This prevents unexpected, expensive repair bills. Basically OTIS Maintenance is designed to keep elevators running like new on a fixed budget basis.

Only Otis Maintenance offers these advantages to owners of Otis Freight Elevators

- "Engineered Service" by the maker maintains the original efficiency of the installation and assures peak performance at all times.
- Services of factory-and-field trained men with a knowledge of elevatoring that can't be matched.
- Availability of original or improved replacement parts for every installation, regardless of its age.
- Freedom from unexpected, expensive repair bills. There's just one fixed monthly charge. It can be budgeted. It's adjusted annually, up or down, on labor and material costs only. Never because of the age or condition of the equipment.
- Guarantee of the maker's high standards of safety through the constant checking and replacing of parts in advance of their breakdown point.
- Elimination of all guesswork in testing and repairing by using specially designed tools and electronic equipment to minimize shutdowns.
- Systematic upkeep and replacement of parts extends the life of an installation indefinitely.
- The value of a maker's pride. A perfectly performing Otis installation is Otis' best salesman. That's why we're never satisfied with anything less than peak performance at all times.

Baker Trucks with a paper-roll grab on a 360° revolving head can pick up, carry and stack rolls in any position.

Baker®
industrial trucks

The Baker-Raulang Company, an Otis subsidiary, is the maker of Baker Gas and Electric Industrial Trucks.

maintenance

that keeps freight elevators running like new

OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

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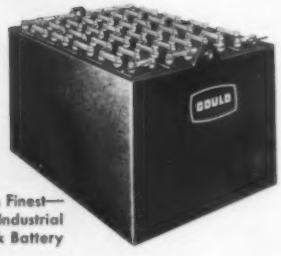
Why worry about Batteries...

Specify **gould** and relax



America's Finest—
Gould Industrial
Truck Battery

Dependable battery performance day in, day out is worth more to you than any other single benefit. Right? That's why Gould has carefully perfected the design of Gould Batteries over long test years. Manufacturing techniques at Gould are also the result of patient development, so that today you are assured of maximum power, long life, and trouble-free operation with *every* Gould battery you buy. Ask for new booklet "...so you're going to buy an industrial battery." Write Gould-National Batteries, Inc., Trenton 7, N.J.

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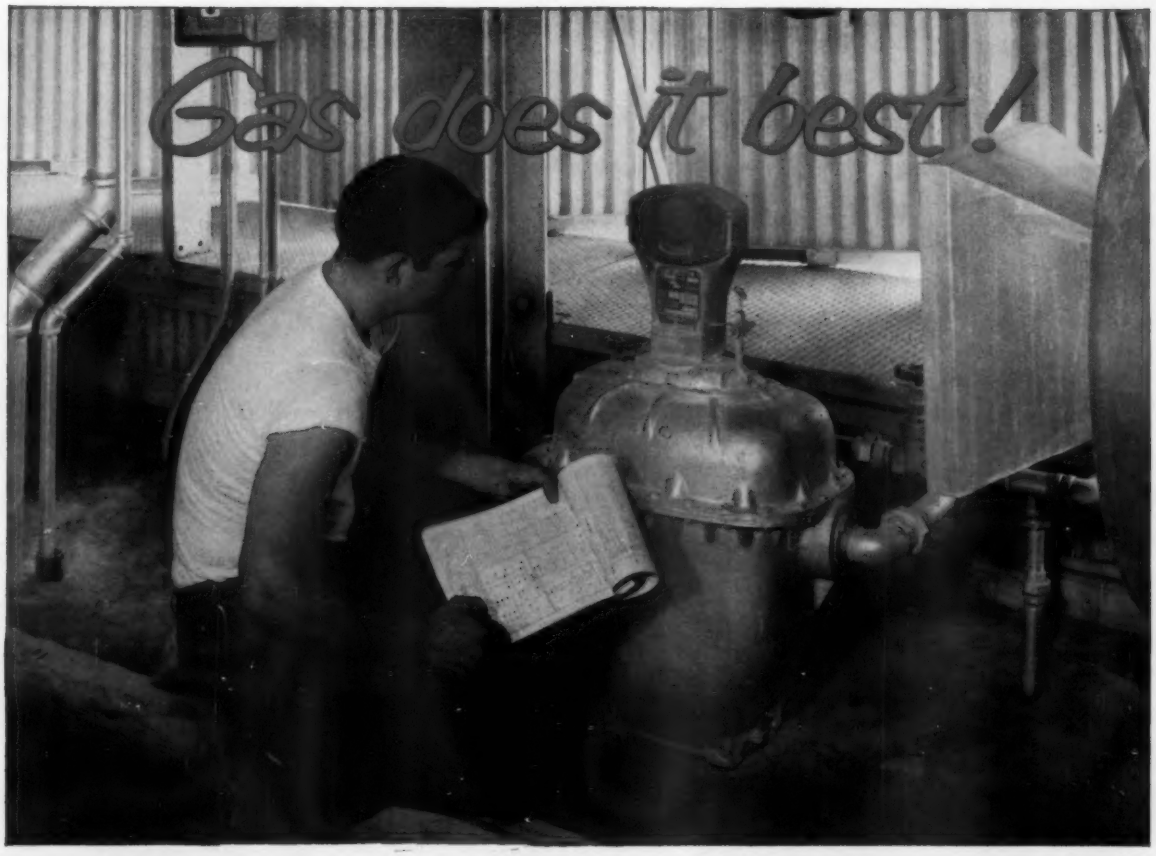


METER YOUR INDIVIDUAL FURNACES TO CONTROL QUALITY AND COSTS

When you process with gas, metered records of consumption will quickly show up combustion deficiencies that affect the quality of your end product. Meters standing guard at every burner will discourage wasteful fuel practices. And only from metered records of the fuel used can you arrive at accurate costs.

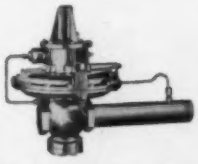
Why don't you investigate the advantages of metering individual furnaces, kilns or ovens? Learn the economies of using Rockwell meters as production tools. *Write us or use the handy coupon.*

ROCKWELL

ROCKWELL GAS METERS and REGULATORS

Good Combustion Requires Close Regulation

For Low Pressure Burners



For High Pressure Burners

Good combustion control is the key to good process control. Rockwell makes a complete line of pressure regulators for all types of industrial burners. Use the coupon for full details.

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Gentlemen:
I am interested in your meters for measuring gas to individual furnaces ☐. Your pressure regulators for burner control ☐. Please send literature ☐. Have representative call ☐.

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MIXING NEARLY 2 MILLION TONS OF ASPHALT YEARLY . . .

WESTINGHOUSE GEARMOTORS SET 15-YEAR DEPENDABILITY RECORD

Mounted on top of a 36-foot high aggregate elevator, this Westinghouse gearmotor moves 6600 lbs. of rock a minute from the ground to the vibrating screen. There has not been one failure in 15 years in either motor or gearing despite repeated high torque requirements and adverse weather conditions.

"We have used Westinghouse gearmotors in our plants for more than 15 years," reports E. J. Woodward, Chief Engineer of Industrial Asphalt, Los Angeles. "Gearmotors driving the hot elevators take the toughest strain. Most of these units have been operating 15 years without replacement or addition of new bearings or motor armature. These drives take occasional overloads safely, too. For example, we've increased output from 230 to 283 tons per hour without a failure."

"As a manufacturer of these asphalt plants, we demand absolute dependability in all components,"

Twenty-two plants owned by Industrial Asphalt Company (like the one shown above) supply more than a third of the Los Angeles County asphalt paving material requirements.

Eight different drive assignments in these plants are handled by rugged Westinghouse gearmotors.

remarked M. B. Preeman, of Standard Steel Corporation. "Dependable service is the primary reason for using Westinghouse gearmotors in Standard Steel asphalt plants."

Here's another example of the type of service you can expect from Westinghouse gearmotors and speed reducers. You can get immediate delivery in horsepower ratings from 1 to 100; reduction ratios to 58.3:1. Call your local Westinghouse sales engineer, or write, Westinghouse Electric Corporation, Gearing Division, 200 McCandless Avenue, Pittsburgh, Pennsylvania. J-07355

YOU CAN BE SURE...IF IT'S

Westinghouse

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PLANT ENGINEERS CUT LABOR TIME 75%

WITH NEW CORROSION-FREE DRAINAGE SYSTEM

Industry develops new easy-to-install low cost drainage pipes and fittings of PVC based on EXON 402-A

. . . another use typical of the Pin-Pointed Properties in Exon Vinyl resins

Tube Turn Plastics, Inc., timed a journeyman plumber as he made a bell and spigot joint in a 2" Schedule 40 alloy cast iron line. *It took 3 minutes, 45 seconds.*

Then he joined a length of new 2" Schedule 40 PVC pipe to a newly developed PVC socket type solvent welding drainage fitting. *Complete time: 56 seconds . . . a labor saving of 75%.*

This is one reason it is more economical to dispose of corrosive industrial liquid wastes with drainage systems of PVC based on Exon 402-A resin. Installation requires less labor per joint . . . fewer tools and materials . . . and fewer joints.

The new socket type drainage fitting eliminates troublesome corrosion pockets and gives you unimpeded flow conditions. It is unaffected by ground conditions, acid or alkaline, wet or dry. It is not subject to galvanic or electrolytic action.

Exon 402-A is just one resin in industry's most complete line of versatile vinyls. No wonder industry looks to Firestone for engineered answers to its needs.

For resin properties pin-pointed to the best answer to your own plant or product problems, check with Firestone.

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EXON

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INDUSTRY'S MOST COMPLETE LINE OF VINYLS ENGINEERED TO YOUR SPECIFIC NEEDS

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BULLETINS just released and of immediate plant interest

MATERIALS HANDLING

101 Hydraulic Lift Trucks—Catalog 257, 24 pp, provides factual information on company's line of manually propelled, battery operated hydraulic lift trucks. Features are fully detailed and specifications on a variety of models are given, including straddle trucks, heavy duty lifts, the Counterweighter, the drum handler, the telescopic for higher lifts, and other manual, straddle and platform lifts. Big Joe Mfg. Co.

102 Industrial Trucks — Electric driven trucks for every industrial application are illustrated and described in this 16-pp catalog. Industrial truck selection factors are detailed and a selector guide showing characteristics, capacities and other data is included. Complete specifications for various types of trucks are also given, as well as photos and dimensional diagrams. Automatic Transportation Co.

103 Electric Fork Trucks—This 8-pp brochure describes operational characteristics and mechanical details of company's line of electric fork trucks. Major components are described, advantages of automatically controlled first point of power are analyzed, and dual field drive is defined in terms of user benefits. Industrial Truck Div., Clark Equipment Co.

104 Adjustable Ramps—Operating, installation and design information on adjustable powered ramps for loading docks is featured in this 6-pp brochure. Details various models of the Adjust-A-Dock, a hydraulic leveling device which may be installed within, or in front of, docks to compensate for variances between carrier and dock heights. Also pictures pre-assembled units, and a leveling device installed in pavement in front of dock. Rowe Methods, Inc.

105 Belt Conveyor Idlers—Eight-pp Bulletin 119 describes a line of belt conveyor idlers including troughing, flat, self-aligning, rubber disc and return designs; 4- to 6-in. diam rolls; fitted with Timken or Sealed-for-Life bearings. Discusses construction, lists standard sizes, dimensions and weights. The C. O. Bartlett & Snow Co.

106 Car Pullers—Bulletin J-11, 32 pp, contains a description of several installations and various types of car pullers for moving freight cars, barges, scrap buggies, furnace cars and many types of industrial transfer cars. It features case histories of typical users, design and selection data, ratings and dimensions and installation data, and is fully illustrated with photos and dimensional diagrams. Hewitt-Robins, Inc.

107 For Efficient Freight Handling—This performance report on the Trackmobile for use in plant switching, spotting and hauling operations describes and diagrams the seven step operation two units perform in a typical manufacturing plant. Photos illustrate how the units cover the entire plant, moving a minimum of 100 freight cars a week. Whiting Corp.

LUBRICATION

108 Lubricating System—Bulletin 70, 8 pp, describes a new type of circulating oil system developed for application on presses and semi-automatic machine tools, with built-in return oil arrangements. Self-actuated alarm feature is described and schematic cutaway views trace flow of lubricant. The Farval Corp.

109 Lube Fittings—Covering a complete line of lubrication fittings, this 32-pp catalog serves as a simple, handy guide to selection of right fitting for every requirement. Included among listings are fittings developed for many special purposes, such as relief fittings, measuring fittings, drive fittings. Individual dimensions ready for transfer to blueprints are provided. Catalog also presents accessories such as bushings, elbow bodies, plugs, couplers etc. along with specifications and application information Alemite Div., Stewart-Warner Corp.

VALVES, TRAPS, PIPING AND ACCESSORIES

110 Diaphragm Valves—Twelve-pp Catalog 104 describes features of manufacturer's diaphragm valves for positive closure and the latest in plastic valves and diaphragms for corrosive services. A quick reference chart for diaphragm material selection is included. Dimensional specifications for several valve models are also shown. Hills-McCanna Co.

111 PVC Valves, Fittings — This 16-pp bulletin describes polyvinyl chloride valves and fittings offering resistance to most salts, alkalis and acids. Bulletin provides application tables on performance of normal impact PVC valves and fittings for handling 315 fluids. Cutaway drawing and text detail design features for long-time control of corrosives. Tables show physical properties, recommended working pressures and effect of temperature on working pressure. Fittings for threaded and welded pipe are shown, and installation and assembly guides for piping systems included. Walworth Co.

112 Flexible Valves — Flexible, pinch-type, hose-bodied valves for abrasives, corrosives, slurries and foods, are detailed in 50-pp Catalog FL-1116. Both standard and metal-enclosed designs are included. Advantages of valves are stressed, and a broad range of fluids handled are listed, according to industry classification. Specifications, materials of construction and dimensions are given for both manually-operated and motor-operated models. A technical data section provides capacity, flow and correction factors; installation and maintenance instructions. Farris Flexible Valve Corp.

113 Check Valves—Basic check units, which can be combined with any standard pipe fitting to form a complete check valve, are described in 8-pp Form 300. Illustrations show unit used with a reducing bushing, 45-deg el, side outlet, drain elbow, bend and standard elbow as well as with tanks and pressure vessels. Pressure and temperature ratings are listed, as well as sizes and weights and other data. Durabla Mfg. Co., Inc.

114 Valves for Steel Mills—Sixteen-pp Bulletin SM-1, titled, "Valves for Automation in the Steel Mills," shows various piping and valve arrangements for particular applications. These include supply water from source to mill; emergency city connection; spray valves for hot strip mills; coke quenching and drain valves. Golden-Anderson Valve Specialty Co.

115 Pump Valves—This 8-pp bulletin describes pump valves redesigned to incorporate a new taper-lock stud, self-locking nut and drop-on guard. Features are illustrated. Tables give pressure-temperature ratings, materials of construction, seat sizes. Durabla Mfg. Co.

116 Impulse Steam Traps—Bulletin T-1746 announces the Yarway Series 40 impulse steam trap designed especially to handle heavy condensate loads. Describes the operation of the trap, gives sizes and capacities, lists typical applications, and shows dimensions, weights and prices. Yarnall-Waring Co.

117 Corrosion-Resistant Coupling — Bulletin 270 describes the HK coupling, a quick-connect coupling using Teflon seals, designed for handling acids, alkalis, solvents and high pressure steam. A cutaway view illustrates component parts. Snap-Tite, Inc.

118 Titanium Pipe, Tubing—Bulletin TDC-185, a 12-pp technical data folder, discusses seamless titanium metal pipe and tubing. Presents in detail the size range and tolerances as well as a description of the mechanical, physical and working properties of titanium in tubular form. Tubular Products Div., The Babcock & Wilcox Co.

119 For Pipe Marking—How to select self-adhesive pipe marking materials is told in 8-pp catalog 2157. Over 500 self-adhesive vinyl plastic pipe markers carried in stock and conforming to accepted standards are listed. Cut-out numbers and letters and safety slogans are shown along with other self-adhesive products used in plant maintenance and safety programs. Printed Cellophane Tape Co.

120 Friction-Loss Calculator — This handy pocket slide calculator is designed for figuring water pipe and paper stock pipe friction losses. Data for computing water pipe friction loss are based on standards of Hydraulic Institute and appear on one side of calculator while those for determining paper stock pipe friction loss are on the other. Also carries a table of equivalent lengths of straight pipe for valves and fittings for turbulent flow. Allis-Chalmers Mfg. Co.

121 High-Temp Insulation—This 6-pp bulletin covers Thermasil calcium silicate insulations for temperatures to 1200 F. Gives basic sizes of insulation for pipe covering and block for process vessels or other equipment. Includes data on basic features. Physical properties are tabulated and thermal conductivity given in graph form. Tables give simplified thickness standards for pipe coverings that permit nesting of layers. Ehret Magnesia Mfg. Co.

PUMPS, PUMPING

122 Industrial Pumps—This 8-pp bulletin, Form 409, features application data on pumps for petroleum products, including LP-gas, many types of chemicals, dry cleaning fluids, paints, resins, diesel fuel, food products such as milk, chocolate, syrup, hog fat, as well as all types of asphalts, tars, road oils, etc. Typical installations are illustrated and performance details described. Viking Pump Co.

123 For Pumping Corrosives—To help select corrosion-resistant pumps for any application to 350 gpm, 20-pp Ace Pump Manual CE-55 gives comparative data for four types of pumps. Molded hard rubber centrifugal pumps, rubber-lined centrifugal pumps, Neoprene impeller pumps and gear pumps are included. Manual lists nearly 200 common chemicals and tells which pumps are suitable at room, warm or hot temperatures. Capacity charts and specifications included. American Hard Rubber Co.

On pages 269-270 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

124 Submersible Pumps—Eight-pp Bulletin B-1000 describes 6- and 8-in. deep well submersible water supply pumps, used for plants, institutional and commercial buildings, and all types of services such as water supply, air conditioning, processing, and fire protection. A large cutaway view shows component features, and a performance chart tabulates engineering data. Sumo Pumps Inc.

125 Metering Barrel Pump—Bulletin 1256 describes advantages of company's controlled volume barrel pump in combined pumping and metering of toxic or corrosive chemicals from barrels or drums. Specifications and dimensions are included. Milton Roy Co.

FANS, VENTILATING AND AIR CONDITIONING

126 Industrial Fans—A broad line of industrial fans, including low silhouette 'dome' type roof and wall ventilators, centrifugal roof ventilators and utility blowers, air blasters and man coolers, in addition to panel and tubeaxial general and pressure duty exhaust fans, are featured in 20-pp Form PL-801. Illustrations, features, dimensional and performance data for each product type are included. Power Line Fan Co.

127 Air Moving and Conditioning—Purposes and activities of the air moving and conditioning association are described in this 12-pp pocket-size booklet. Covers functions of the association and tells how it helps the industry and the public. Air Moving and Conditioning Ass'n, Inc.

BULLETINS

(Begins on page 21)

128 **Guide to Diffusers**—Eighty-pp Selection Manual 60 presents air diffusers for air conditioning, heating and ventilating systems. Contains numerous diagrams, tables and photos to aid in selection of diffusers and accessories for all-air high velocity and conventional air conditioning systems and units. All types of round, square and straight line diffusers are pictured. Included in manual are air distribution definitions, sound level characteristics, static pressure factors. Anemostat Corp. of America.

129 **Automatic Air Filtering**—Bulletin 780 describes air handling units that incorporate automatic air filtration. Explains adaptability of the filtering by the roll principle to heating and ventilating units, industrial heaters, auditorium unit ventilators, and air conditioning units. Dimension drawings and specification charts are included. American Air Filter Co., Inc.

130 **Packaged Water Chillers**—Two new series of Flow-Pac water chillers—small tonnage air conditioners and industrial liquid chillers—are described in 6-pp Catalog 560. Covers complete mechanical specifications, water temperature ranges, Btu capacities, pressure drop data and suggestions for use. Acme Industries, Inc.

131 **Packaged Chillers**—Catalog 533, 16 pp, describes a series of nine Flow-Therm packaged liquid chillers rated from 20-through 125-ton capacity. Lists advantages, points out application of units as heat pumps with factory-installed change-over valves, and includes engineering data, capacities, pressure drop data, condenser water requirements. Acme Industries, Inc.

HEATING

133 **Gas Heating Equipment**—Catalog GN-57, 18 pp, covers company's gas-fired commercial and industrial heating equipment, including suspended gas unit heaters, a floor model heater, two series of duct furnaces, and a horizontal furnace. In addition to specifications, construction details and dimension drawings and tables, it also contains installation and application information. Reznor Mfg. Co.

134 **Cabinet Convectors** — This 28-pp data guide on Code rated cabinet convectors for steam and hot water heating systems lists details of design and construction for installation in commercial, industrial and other buildings. Photos and schematic drawings illustrate the text, and technical data, hot water capacity statistical tables for all models, miscellaneous capacity data, and typical piping arrangements for both hot water and steam systems are included. Dunham-Bush, Inc.

135 **Finned Tube Radiation**—Catalog FT-55, 20 pp, describes finned-tube radiation and enclosures for commercial and industrial uses. It covers 15 basic heating elements and company's "F" sloping top, "E" flat top, Sil-Vector and Sil-N-Wall enclosures. Ratings and dimensions, illustrations are included. The Rittling Corp.

MECHANICAL POWER TRANSMISSION

136 **FHP V-Drives**—Form F-10 is a 46-pp source of information on fractional horsepower V-drives and drive parts and accessories. In the range of fractional to 10 hp, it presents descriptions and complete size data on company's line of bushed type and fixed-bore type cast iron and pressed steel V-pulleys, V-belts, refrigeration fans and fan pulleys, and V-drive accessories. An engineering data section is also provided in this book. Maurey Mfg. Corp.

137 **Speed Reducers**—Use of double-enveloping worm gearing in Cone-Drive speed reducers is described in 24-pp Bulletin CD-218. Standard stock capacities are listed, and specifications for all extended shaft and shaft mounted models are given, as well as dimensioned drawings and tables of mechanical and thermal hp ratings, output torque ratings and chain pull ratings. Cone-Drive Gears Div., Michigan Tool Co.

138 **Data on Drives**—Data Book 10 is a 112-pp engineering guide on selection and design of Poly-V belt drives. It contains charts, tables and diagrams along with specifications for all drive sizes. Selection of proper belts and sheaves for drives of any speed or horsepower is made possible, without calculation, by standard drive tables. Book covers theory and practical application of the new R/M Poly-V drive, along with illustrated case histories. Comprehensive data on V-belt drives is included—drive tables, ratings, installation instructions and trouble shooting. While not a textbook, this manual should prove useful to those concerned with industrial belt drives. It is available to qualified plant engineers. Please state your job title when requesting it. Manhattan Rubber Div., Raybestos-Manhattan, Inc.

139 **On Worm Gear Drives**—Sixteen-pp Bulletin 145 provides "fingertip facts" on standard speed reducers, worm gear sets and special units. Horizontal right-angle reducers, vertical reduction units, multiple reduction units, fan cooled types are among those covered in detail and some specialized reducers for custom-design requirements are illustrated. Generously illustrated, book covers special features of the various drives and their applications. The Cleveland Worm and Gear Co.

140 **Industrial Gearing**—Twelve-pp Booklet B-7012 outlines design facilities and manufacturing capacity of company's gearing division in producing custom-made gearing. Specialized machinery and heat-treating equipment are shown along with text covering the BP taper hardening process. A complete machinery listing is included. Westinghouse Electric Corp.

141 **Magnetic Clutch**—Bulletin M-101, 6 pp, details advantages of company's magnetic clutches for industrial applications. Provides dimensional drawings and specifications on Model SC magnetic clutch, Model SB magnetic brake, and Model SBR magnetic brake. Fawick Airflex Div., Fawick Corp.

TOOLS AND WELDING

142 **Portable Drill**—A portable drill which eliminates the need for moving material to stationary machinery is described in this 8-pp "Toggle Bug" bulletin. Operational features and construction details are described and specifications are tabulated. Guibert Steel Co.

143 **Two Diameter Drilling** — This 8-pp booklet discusses the advantages of Subland two diameter drilling as opposed to step drill two diameter drilling. Enumerates steps in manufacturing of both types, presents maintenance requirements of each, and contrasts production records, as well as presenting figures involved in initial cost against production savings. Mohawk Tools, Inc.

144 **Oxide Cutting Tools** — Stupalox high-strength oxide-base cutting tools are described in 12-pp Catalog 257. In addition to technical description and a table of physical properties, bulletin lists tool holders, and dimension and prices of throwaway inserts, solid inserts and unground blanks. Stupakoff Div., The Carborundum Co.

145 **Collets and Feeders**—Catalog 22, 24 pp, contains a wealth of tips for the solution of collet and feeder problems. Featured are standard collets and feeders, the quick change Master collet and Style L Master feeders, full floating Master collets, Burns style taper lock Master feeders and the Super feeder. Each model is fully covered with price lists, ordering instructions, cross-section views and illustrations. Sutton Tool Co.

146 **Blades and Saws**—Booklet 1032, 10 pp, features company's break-resistant blades, masonry and concrete saws. Complete price and specification information is furnished on such items as the 2-hp Supermatic masonry saw with Hi-Lo control wheel and Sta-level cutting head, the Select-A-Notch masonry saw, concrete saws, diamond, break-resistant and abrasive blades. Clipper Mfg. Co.

147 **Welding Repairs**—This illustrated bulletin covers welding repairs of structural and processing equipment as well as fabrication of the latter. Outlines various welding processes used for making repairs to broken or worn machinery, structural repairs to storage tanks, material handling equipment, twisted crane booms, hot strip rolls, pinions and machine frames, shafts, and others. Metalweld, Inc.

Reader Service Cards for ordering bulletins are on pages 269-270. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

148 **On Pipe Welding** — Developments in welding of steam-power piping are described in 8-pp Booklet F-1055. Dealing with the welding of chrome-moly alloy-steel piping, this article reviews work done to improve welded power piping in recent years. Photos and tabular data augment text. Linde Air Products Co., Div., Union Carbide and Carbon Corp.

149 **Standard Welding Control** — Bulletin GEA-6408, 12 pp, describes standard non-synchronous resistance welding controls, discusses variety of available combinations, lists typical applications, explains use of plug-in control units and ignition contractors, lists features, and provides dimensions of contactor and control enclosure combinations. General Electric Co.

150 **Special Welding Control** — Bulletin GEA-6593 describes non-synchronous resistance welding controls for special combination-control or single- or multi-electrode welding machines, and for sequence control of automated machines. Lists features, provides description, operation, and typical applications. General Electric Co.

METAL FINISHING

151 **Barrel Finishing**—This 12-pp booklet presents case histories showing how specific manufacturers benefited through use of the Honite method of barrel finishing. Advantages are detailed and results in terms of increased production and economy are shown. Booklet is illustrated with before-and-after pictures of a variety of parts, as well as charts in indexing types of media and compounds and their uses. Minnesota Mining and Mfg. Co.

152 **Blast Cleaning**—Catalog 129-D, 12 pp, contains detailed descriptions of the 14 cf Super Tumblast. Cutaway drawings illustrate design features and complete construction details and specifications included. Wheelabrator Corp.

WATER, WASTE TREATING

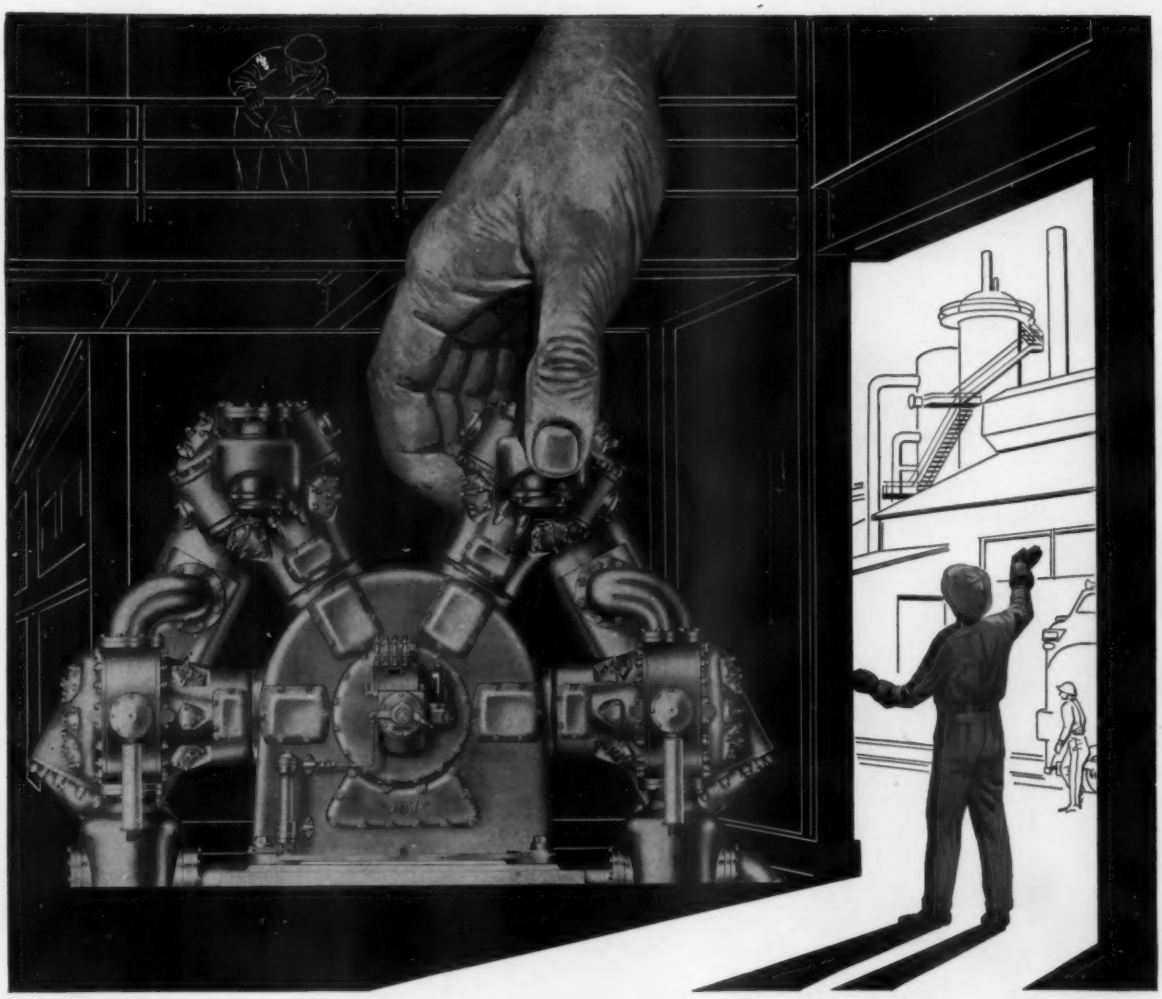
153 **Water Treatment Selection** — Reprint 111, 8 pp, is an ASME conference paper on selecting water-treating processes for medium-pressure boilers. Covers determination of proper treating process in a paper mill in which, finally, hot lime zeolite was installed. Gives some economic studies of various methods for silica reduction and describes operating experiences since the hot lime zeolite process was installed. Cochrane Corp.

154 **Deaerators**—Bulletin 102-A, 8 pp, describes advantages and applications of company's stainless steel deaerators. Discusses need for water deaeration in boilers, feed pumps and piping, and covers operating principles of deaerator. A cutaway photo of the entire unit, plus a close-up detail drawing of the stainless-steel head section, trace path of water from entrance to storage in deaerator tank. L & A Water Softener Co.

155 **Water, Waste Treatment**—Bulletin 80, 32-pp, deals with products and processes for water and waste treatment. Contains cross-references for detailed bulletins devoted to specific equipment in municipal, industrial, sewage and industrial water treatment fields. Fully illustrated, covers aerators; chemical feeders; proportioners; coagulation, precipitation and stabilization equipment; mixers and coagulators; clarifiers, filters and control equipment; ion exchangers, others. Infilco Inc.

156 **On Biological Fouling**—Eight-pp Technical Paper 134, discusses biological fouling in recirculating cooling water systems. Covers common problems of slime, algae in these systems and points out how deposits of biological origin can interfere with heat transfer. A discussion of control agents for overcoming this situation is included. Betz Laboratories, Inc.

(More Bulletins on page 271)



SET A 500 TO 1000 HP AIR COMPRESSOR IN THE CORNER OF YOUR PLANT . . . *almost as easy as this*

IF YOUR EXPANDING PLANT FACILITIES are requiring more compressed air . . . *and* putting a squeeze on plant space, here's the answer . . . the *new* Joy WN-224 compressor. Because of its compact semi-radial design, the WN-224 is delivered as a package—completely assembled—ready to go. Just bolt it down, connect power, water, and air lines . . . and you're ready for long, continuous service. This is the only true "package" compressor available in these capacities . . . 2418 to 6048 cfm . . . horsepower ratings from 350 to 1000.

AND THE WN-224 SOLVES YOUR SPACE PROBLEMS . . . it can be installed where no other compressor of equal capacity will fit. Instead of long, horizontal units on massive foundations, the Joy WN-224 has four cylinders arranged semi-radially around the frame. This compact, balanced arrangement assures smoother running, gives longer service with far less maintenance. Get the whole story on the WN-224 from ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

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Write for FREE Bulletin 179-15

JOY . . . EQUIPMENT FOR INDUSTRIAL PLANTS . . . FOR ALL INDUSTRY

Industrial Compressors

Conveyors

Electrical Connectors

Fans and Blowers

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Only New HALLOWELL *ERECTOMATIC.* Steel Shelving

LESS TIME, MORE UNITS PER HOUR, lower costs with Hallowell ERECTOMATIC steel shelving. Maximum adaptability to meet changing conditions, too.

No matter what type of shelving you need—open, closed, bin units, ledge units, counter or cabinets —there's new Hallowell ERECTOMATIC® steel shelving to make your job easy. The unique built-in locking device* speeds assembly and rearrangement of shelving. To position a shelf—just slide it into place on the shelf supports, press the locks, and the shelf is locked. To reposition a shelf—release the locks, pull the shelf straight out, slide it straight in on its supports at the new location, and press the locks. It takes only seconds to do the complete job.

For complete information, see your Hallowell distributor. Or write Hallowell Shop Equipment Division, STANDARD PRESSED STEEL CO., Jenkintown 26, Pa.

*Patent applied for

TWO MEN ASSEMBLED new Hallowell ERECTOMATIC steel shelving in just over 10 minutes. Closed unit was 36 in. wide, 18 in. deep, 7 ft. 3 in. high, complete with seven shelves. Standard models of other design required from 13-55 min. Table shows test results.

Brand	Time to Assemble (Min.)	Units Per Hour
Erectomatic	10.24	5.75
A	13.23	4.53
B	14.24	4.21
C	16.30	3.68
D	18.12	3.31
E	25.03	2.40
F	55.03	1.09

FAST ASSEMBLY. Just position the shelf supports, insert the shelf, and press the unique locking device. No tools or special instructions necessary.

gives you all these extra-value features

QUICK SHELF CHANGE. Just release the locks, remove the shelf and its supports, relocate the shelf, and press the locks. It takes only seconds.

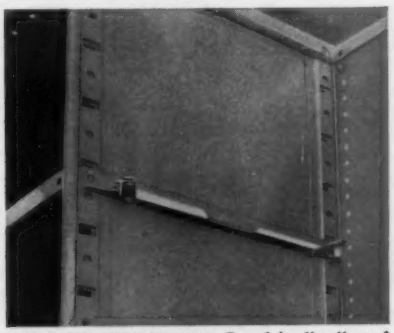
STRAIGHT-IN, STRAIGHT-OUT SHELF CHANGE. No tilting to interfere with any other shelf. No time wasted unloading shelves or removing bin fronts, partial dividers, label holders.

INDEPENDENT SHELF POSITIONING. Each shelf is an independent unit. Can be removed and repositioned without disturbing any other part. All shelves in a rack can be aligned.

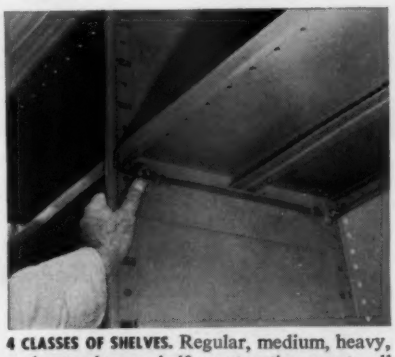
FULL USE OF SHELF AREA. No angles or tees, and beaded corner posts prevent waste of valuable storage space. No box guides are needed.

COMMON SIDE PANELS AND POSTS save assembly time. Also save material between adjacent units in a rack. And both back and side panels are one-piece.

BEADED POSTS AND FLANGED SHELVES prevent snagging of clothing or stored goods. Also prevent injuries from sharp, ragged edges.



FULL DEPTH SHELF SUPPORT. Load is distributed over full depth of shelf. No buckling is possible. Reinforcements can be added when they are required.



4 CLASSES OF SHELVES. Regular, medium, heavy, and extra-heavy shelf construction meets all load requirements. Made to government specifications. Extra-heavy shelf shown.

STANDARD PRESSED STEEL CO.

HALLOWELL® SHOP EQUIPMENT DIVISION SPS

JENKINTOWN PENNSYLVANIA

For more facts circle 516 on Reply Card

Why the new LINK-BELT Series 50 belt conveyor idler starts saving you money right from the start

LOW FIRST COST is one of many savings offered by the Series 50 idler. Others include fast, easy installation . . . minimum power, upkeep and space requirements.

CLOSE POSITIONING of ball bearings to shaft supports minimizes shaft deflection. Deep-groove, single-row ball bearings are smooth, free-rolling—withstand thrust, radial and combination loads.

IDLER ROLLS are self-contained, balanced units with high-grade bearings fully enclosed and protected. Other features include heavy-wall steel center tube and protected grease fittings.

TRIPLE LABYRINTH SEAL keeps grease in, dirt out . . . protects all moving parts . . . reduces maintenance. Factory-sealed idlers incorporate flexible synthetic rubber lip seal for added protection.

LINK-BELT Series 50 idler answers need for low-cost conveying of medium loads—for intermittent operation

New from base to ball bearings, the Link-Belt Series 50 idler is specifically designed for belt conveyors handling maximum loads of 100 lbs. per cu. ft. and moderate lump sizes. This addition to industry's most comprehensive idler line features smooth, balanced, concentric rolls with rounded edges for longer belt life. Yoke contour in sturdy, formed steel brackets and slot on shafts lock all brackets together in a rigid truss structure—won't spread under load.

For facts on the Series 50, see your nearby Link-Belt office or authorized stock-carrying distributor. Ask for Book 2516. For information on industry's most comprehensive belt conveyor idler line, get Book 2416.

LINK-BELT

BELT CONVEYOR IDLERS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,492

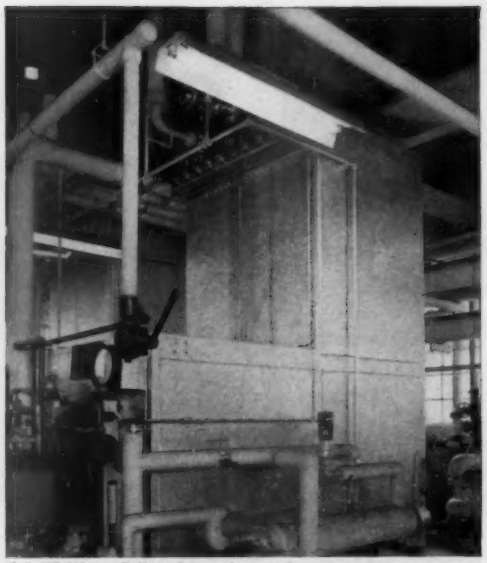
For more facts circle 517 on Reply Card

The Cross Company specifies . . .

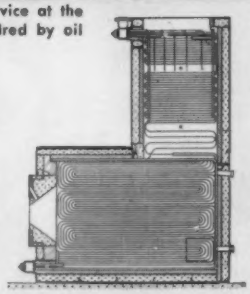
High temperature water by C-E for heating economy ...low maintenance

The Cross Company, pioneer producer of automation machinery, has recently completed an ultra-modern plant in Fraser, Michigan — practically doubling its former production capacity. After a thorough study of heating requirements . . . and with a view toward further expansion . . . two C-E LaMont Controlled Circulation Hot Water Boilers were specified for the new plant. According to Mr. W. P. Reece, Plant Engineer, "the study indicated that this system would provide the lowest fuel and maintenance costs . . . Experience during this winter confirms the soundness of our decision."

If you are in the market for a heating or process system, it will pay you, too, to investigate high temperature water. Individual needs vary, of course, and both hot water and steam boilers have their place. Our engineers will be pleased to discuss the subject with you or your consultants. Write for our catalog HCC-2.



C E HT Water Boilers in service at the Cross Company. They are fired by oil or natural gas.



Right — One of the 12 million Btu/hr Cross Company boilers. C-E HT Water Boilers are available in sizes from 10- to 300-million Btu per hour; pressures to 500 psi and temperatures to 470F.

Architect's drawing of the new Cross Company plant, Giffels and Vallet, Detroit, Consulting Engineers; Owen S. Lieberg, Associated Consultant.

THESE ARE THE GENERAL ADVANTAGES OF HIGH TEMPERATURE WATER:

1. Higher available heat — many times that of steam at the same pressure.
2. Closer control of temperature.
3. Lower heat loss . . . unused heat returns to the boiler . . . no condensate return lines.
4. No elaborate feedwater treatment . . . make-up requirements are exceptionally low.
5. Steam traps not required . . . trap problems and expense are eliminated.
6. No blowdown losses . . . no safety valve vent losses . . . no condensate losses.

THESE ARE THE SPECIFIC ADVANTAGES OF THE C-E "HT" WATER BOILER:

1. Complete control over circulation in both system and boiler.
2. No separate boiler pump is required, since low pressure loss is inherent.
3. Pressurized operation with oil or gas means no induced draft fan.
4. Single-pass design — no baffles — means cleaner boiler and lower draft loss.
5. Controlled, positive circulation permits more efficient arrangement of heating surfaces.
6. Any fuel — oil, gas, coal, or any combination of fuels.
7. Gastight, welded, steel casing.
8. Fewer headers, all of which are easily accessible.

COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

CANADA: COMBUSTION ENGINEERING-SUPERHEATER LTD.

B-990A

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

For more facts circle 518 on Reply Card

GENERAL ELECTRIC SYNCHRONOUS

MOTOR CONTROL ASSURES

Maximum drive protection through "split-second" field removal

General Electric controls provide the fastest field removal—the most protection—available for synchronous motors and attached equipment. General Electric's "split-second" field-removal system removes the field excitation in approximately 1/120 of a second: technically, within one-half-slip cycle.

This field-removal system virtually eliminates the possibility of damage to synchronous motor drives that results from the motor pulling out-of-step. In the event of excessive torque, or fluctuations in line and excitation voltages, the control immediately removes the field excitation. This prevents damage to motor windings, to connected machinery, and to the distribution system, caused by the motor running out of synchronism with the field applied.

CONSTANT PROTECTION

G-E synchronous motor control provides constant protection from the time the start-button is pushed until the motor is de-energized. A graduated protection system prevents motor damage from overheating while starting but allows full utilization of the motor during acceleration. This system is controlled by the heating characteristics of the motor and not by a set time period.

MAXIMUM MOTOR UTILIZATION

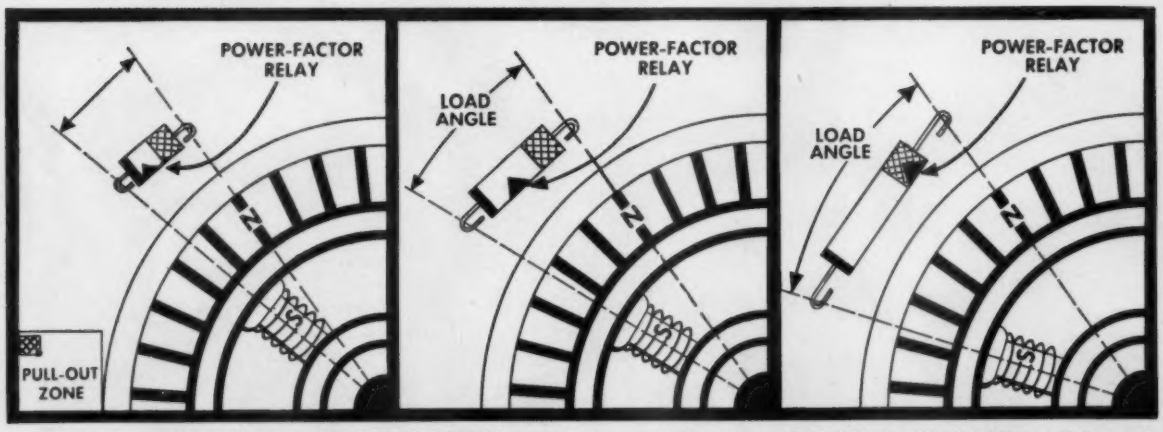
Your motor will deliver the power it was designed to produce as a result of the G-E precision field application system. The field is applied at exactly the right instant—assuring positive synchronization on the first attempt. In addition, the harmful effects of repeated slipping of poles and resulting motor stress are eliminated.

Assure maximum protection and utilization of your synchronous motor . . . specify the control that gives you all the "extras" as standard equipment: General Electric synchronous motor control. For more information, write for GEA-5873B, to Section 783-6, General Electric Co., Schenectady, N. Y., or contact your nearest G-E Apparatus Sales Office.

Industry Control Department, Roanoke, Virginia

GENERAL ELECTRIC

FASTEST FIELD REMOVAL AVAILABLE



DURING NORMAL OPERATION, the load angle is constantly measured by power-factor relay.

ADDITIONAL LOAD on motor increases load angle. Relay will not remove field if flux is sufficient to hold motor in step.

EXCESSIVE OVERLOAD, sufficient to cause out-of-step operation widens load angle, causes control to remove field.

For more facts circle 519 on Reply Card

from PLANS to fully equipped PLANT...

broom

and ready for production

...COMPLETE, by

F. H. McGRAW & COMPANY

Engineers and Constructors to American industry

780 Windsor Street, HARTFORD, CONN.

NEW YORK • PITTSBURGH • CHICAGO • MONTREAL

PLANT CONSTRUCTION— Bricklaying crews work under canvas during severe weather amid sprawling foundations of a section of the $150-million aluminum plant now being built near Hannibal, Ohio, by F. H. McGraw & Company for Olin Revere Metals Corporation and Olin Mathieson Chemicals Corporation. Six million cubic yards of earth were moved to dig emplacements for the Hannibal plant foundations.

clean

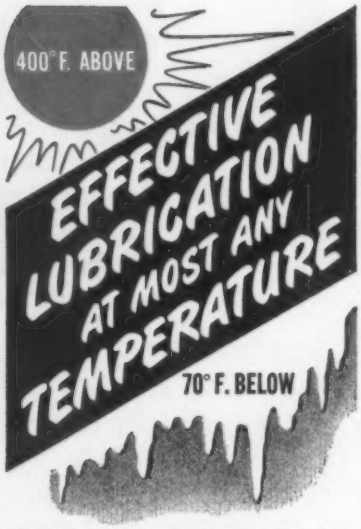
F. H. McGRAW & COMPANY takes on the whole job or any part of the job, from first rough plans through design, engineering, plant construction and mechanical installation, down to the last details of piping, painting and landscaping. A McGraw-built plant is delivered *broom clean*—ready for production.

McGraw men, methods, materials and machines have built an outstanding record of problem-solving construction, minimum interference with current production and on-time (or before-time) delivery. We'd be pleased to have a McGraw engineer consult with you on your construction or mechanical erection needs—with no obligation, of course.

INSTALLATION of this gigantic newsprint machine for Bowaters Southern Paper Corporation in Calhoun, Tenn., was completed for scheduled start-up on Jan. 14, 1957. The machine, wider and faster than two original units at the Calhoun plant which had set world speed records, was designed to produce newsprint at speeds up to 2500 feet per minute.

THE WHOLE PACKAGE—from initial design through construction and mechanical erection—was delivered in this aircraft components plant built by the McGraw company for Fenn Manufacturing Company in Newington, Conn.

For more facts circle 520 on Reply Card



The fact that LUBRIPLATE Lubricants are able to meet extreme temperature conditions demonstrates the ability of these products to cope with the wide variations found in everyday industry. Besides this feature, LUBRIPLATE Lubricants possess attributes not found in conventional lubricants.

HIGH TEMPERATURES

LUBRIPLATE No. 930-AA.—Provides superior and protective lubrication for all types and sizes of machines operating at temperatures as high as 500°F. Possesses exceptionally high film strength and adhesiveness. Protects all metallic parts against rust and corrosion.

LOW TEMPERATURES

LOW-TEMP LUBRIPLATE—The outstanding multi-purpose grease type lubricant that will remain plastic at 70°F below Zero, yet has a Melting Point of 270°F. Resists water and acids—protects against rust and corrosion even from calcium chloride used on paved roads during winter months.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Write for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. LUBRIPLATE DIVISION, Fiske Brothers Refining Company, Newark 5, N. J. or Toledo 5, Ohio.

For more facts circle 521 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

On the Right Track

PLANT ENGINEERING:

"We are operating a corn and soybean processing plant here in Danville.

"Our operation is large enough to require approximately 50 full time maintenance people—20 millwrights (or mechanics) 12 sheet metal workers, six electricians, four pipefitters, four carpenters and three painters.

"First, we are looking for a textbook to use in a sheet metal layout course, which will begin in two months.

"Second, we want to get into the hands of our foremen the proper trade magazines and publications in order to keep them current and/or bring them up to date in the field.

"If you have a textbook or textbooks and publications which you feel are suitable, we shall appreciate your reply." *C. S. Thomson, Engineering Dept., Lauhoff Grain Company, Danville, Ill.*

► PLANT ENGINEERING is sent without charge to those men in industry who are responsbile for plant engineering and maintenance activities. Appropriate application forms may be obtained from either the editorial department or from our Circulation Division, Barrington, Ill. —*Editors.*

Electrical Numbering System

PLANT ENGINEERING:

"Do you know of any published information of numbering systems for plant electrical systems. We are planning to overhaul our numbering system and would appreciate help in this direction." *T. E. Thal, Project Plant Engineer, McCulloch Motors, Corp., Los Angeles, Calif.*

► Concensus of PLANT ENGINEERING editors is that the type of numbering system Mr. Thal is interested in, is almost wholly dependent on the individual plant. We know of no standard numbering system advocated by the National Electrical Societies. We suggest, though, that readers who would like to have more information on the subject should write to Mr. A. B. Morgan of Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y.—*Editors.*

Power Factor Measurement

PLANT ENGINEERING:

"The issue of PLANT ENGINEERING of May, 1954 carries an article titled 'Power Factor Can Be Measured by Ammeter.' This appeared on pages 106 and 107 and was written by C. Spain of Westinghouse Electric Corp.

"We plan to correct the poor power factor at one of our branches; such correction to be determined by measuring existing factor as explained in above article.

"Would you kindly send a tear sheet if still available. If unavailable, please advise and we will reproduce from our copy of the magazine." *F. Perinchief, Facilities Engineer, Arwood Precision Casting Corp., New York, N.Y.*

► It is fortunate that Mr. Perinchief has at least one copy of the article he intends using, for our supply of tear sheets of this popular article is exhausted. We can supply positive photostatic copies at $1.20 per page.—*Editors.*

Dockboard Inquiries

PLANT ENGINEERING:

"In March 1957, PLANT ENGINEERING published an article regarding automatic dockboards, which appeared on page 101.

"We are interested in obtaining additional information as to the manufacturer and cost of installation of this equipment and would appreciate any information." *V. E. McDougal, Industrial Engineer, Lockheed Aircraft Corp., Marietta, Ga.*

PLANT ENGINEERING:

"In the March 1957 issue of PLANT ENGINEERING on page 101, you show automatic dockboards as installed by Ford Motor Company.

"We are interested in obtaining further information on this equipment. Could you tell us who makes them and provide us with their address?" *R. W. Emmott, President, Emmott-Valley Transportation Co., Inc., Uxbridge, Mass.*

► The dockboards mentioned in our article are manufactured by the Kelley Co., Inc., 316 East Silver Spring Drive, Milwaukee, Wis. Readers interested in obtaining further information should write directly to the company.—*Editors.*

No Time Limit, Evidently

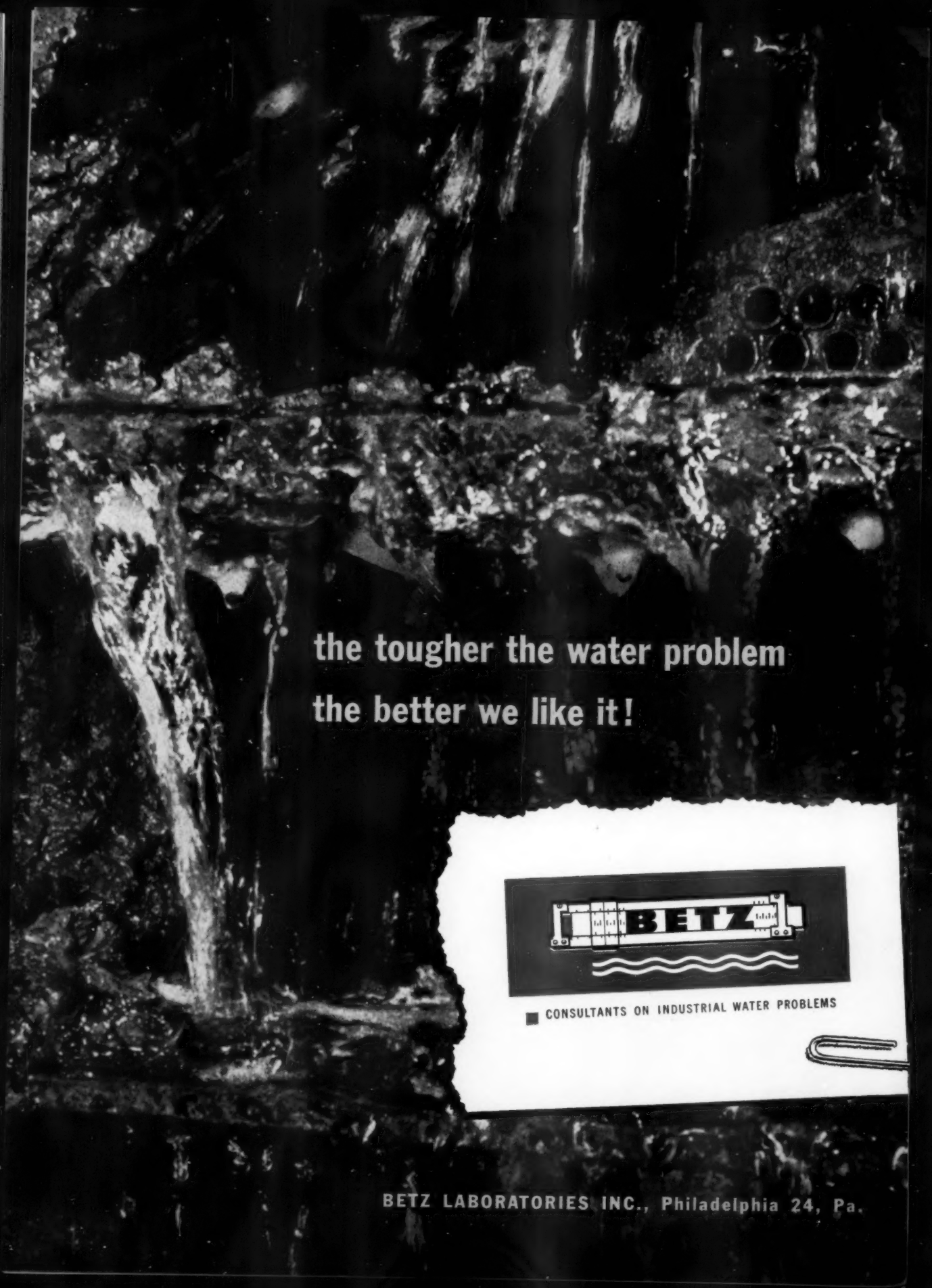
PLANT ENGINEERING:

"One of our engineers is requesting a copy of the article 'Maintenance Blast Cleaning With Corn Cob Grits and Sawdust' from the July, 1952 issue of your magazine.

"Could you please let me have a set of tear sheets? If these are not available, could you supply a photostatic negative? We will be glad to pay any necessary charges." *Eugene F. Anderson, Wheelabrator Corp., Mishawaka, Ind.*

PLANT ENGINEERING:

"Recently, I have been reviewing some back issues of your magazine and found some articles in the January, 1954 issue exceptionally interesting. If available for free distribution, I would appreciate tear sheets of the following articles: 'Cost Control—Bonus from Centralized


the tougher the water problem
the better we like it!
BETZ
CONSULTANTS ON INDUSTRIAL WATER PROBLEMS
BETZ LABORATORIES INC., Philadelphia 24, Pa.

Westinghouse Air Compressors mean money in your pocket

If you use compressed air in your plant...

and who doesn't? . . . it will pay you dollars and cents to investigate the many advantages of installing Westinghouse Air Compressors. Here's why:

- *Pressurized lubrication*
- *Positive low oil level protection*
- *Thermal overload protection*
- *One year guarantee*

In sizes from ½ to 15 hp, Westinghouse compressors can be inexpensively installed around your plant at multiple points of service. If you need a heavy-duty compressor for continuous service rely on Westinghouse air.

W-108

Le Roi Division
Westinghouse
Air Brake Co.
Milwaukee 1, Wisconsin
Distributors in all principal cities

For more facts circle 523 on Reply Card

BACKTALK— FORETHOUGHTS

Maintenance'; 'Effective PM Program for Industrial Trucks'; and 'PM Program Thrives on Control.'

"Your prompt service in answering such requests in the past has proved to be of inestimable value to us and we wish to take this opportunity to again thank you." *W. Noble Kirkpatrick, Chief Transportation Div., The Zia Company, Los Alamos, New Mexico.*

▶ It is good to know that articles from old issues of PLANT ENGINEERING are still proving their worth, but we regret that, for the most part, after this length of time tear sheets of the more popular articles have all been distributed to interested readers. All but the article on maintenance blast cleaning, of which we have a very few copies available, must be obtained by photostating our bound volumes. Cost of these copies is $1.20 per page.—*Editors.*

HP Computor

PLANT ENGINEERING:

"I would appreciate the horsepower computor and booklet 'Fascination in Numbers,' furnished by the Graham Transmission Inc.

"Although I am not a plant engineer, I am a mathematics and theory instructor for Chrysler Corporation. I feel that this material could well be utilized by our staff. This is bulletin 199 listed in your March issue." *Robert L. Pence, Classroom Instructor, Detroit, Mich.*

▶ We have passed this request along to our Readers Service department for processing. We hope Mr. Pence will find the computor and booklet of use and interest to his classes.—*Editors.*

Proving Our Claim?

PLANT ENGINEERING:

"Thank you for sending me the December issue of PLANT ENGINEERING. However, I failed to find the article authored by John Krummell and Walter McIntosh, mentioned in your accompanying letter. This was a deep mystery to me until I found the Authors' Index where I discovered both names with the month of November included with each. Could it be possible that they gave birth to their article in the November issue? Could the article be entitled 'Plant Engineering in South America?'

"I am very interested in this article and would appreciate it very much if you could send me a reprint of the article or the issue of PLANT ENGINEERING in which it appeared.

"Let me not forget to say that I enjoyed reading your magazine from cover to cover. It is all good stuff." *Charles E. Stone, Staff Engineer, Compania Central Altagracia, S. A., Oriente, Cuba.*

▶ Now and again we like to prove that we are human and one of the best ways to do this, we feel, is to err. We would like to point out, though, that this is done on an entirely impersonal basis and we are sorry that Mr. Stone had such trouble in getting the issue of PLANT ENGINEERING in which the article titled "Plant Engineering in South America" appeared.—*Editors.*

Using Residual Fuels

PLANT ENGINEERING:

"I would appreciate it if you could send me tear sheets of the article 'Additives Perk Up Residual Fuels' by W. H. Thompson, of National Aluminate Corporation. This article was published in your September, 1956, issue, Vol. 10, No. 9, on page 105." *J. M. Williams, Pasco Packing Co., Dade City, Fla.*

▶ Tear sheets of this article are available for readers interested in this subject.—*Editors.*

Covering the Field

PLANT ENGINEERING:

"We are very interested in securing literature and information (books, articles, etc.), on the following subjects: The operation of a typical American plant, especially plants engaged in the manufacture of construction equipment—and with particular reference to direct labor, indirect labor, overhead, general and administrative expenses.

"This information is needed for a report now being prepared by us and your New York office suggested that we communicate with you.

"If you could refer us to some books or publications carrying such information we would appreciate it very much." *Herbert E. Nelson, Research and Design Dept., Continental Copper and Steel Industries, Inc., New York, N. Y.*

▶ This is something of an all-inclusive question, covering quite a lot of territory. We have sent Mr. Nelson several articles from past issues of PLANT ENGINEERING along with the titles of several books which we believe will be of interest to him.—*Editors.*

Reprinting Steam Chart

PLANT ENGINEERING:

"On page 93 of your February, 1957 issue there appears a chart which can be used to determine the amount of steam required for heating hot water under various conditions. We believe this chart would be of considerable interest to the readers of a house organ which we edit for our client, Armstrong Machine Works, Three Rivers, Mich.

"May we have your permission to reproduce this chart. Appropriate credit would, of course, be given to PLANT ENGINEERING." *Charles Vasilak, Russell T. Gray, Inc., Industrial Advertising, Chicago, Ill.*

▶ As usual, we are happy to give permission to reprint an article from our magazine.—*Editors.*

new pressure switch

. . . has the appearance and performance you need

Looking for something new, something better, to control or limit the pressure of air, gas, oil? Use this new Honeywell Industrial Pressure Switch . . . designed to complement the most attractive equipment or panels . . . constructed to give lasting performance in the most rugged applications. Use it to make your equipment more automatic, improve your system, provide trouble-free service.

Here are the facts you'll want to know:

- Designed for flush or surface mounting
- Die-cast case is dust and corrosion resistant
- Visible mercury switch position (SPST or SPDT)
- Front-of-case set-point and differential adjustment
- Selection of pressure ranges to 3000 psi
- Specifically designed and constructed for industrial use . . . ½" pipe connection
- Available in explosion-proof construction

For complete data, a consultation on applications, prices for any quantity . . . get in touch with your local Honeywell sales engineer. He's as near as your phone. MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA: Write for Specification sheet S1011-3 "New Honeywell Industrial Pressuretrol"**

MINNEAPOLIS **Honeywell**
BROWN INSTRUMENTS
First in Controls

For more facts circle 524 on Reply Card

DESIGN TESTED AND VERIFIED
in the
Westinghouse
HIGH POWER LABORATORY

Now Westinghouse announces complete control center flexibility

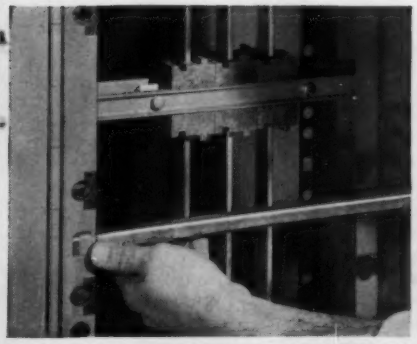
New design meets changing requirements with both 14- and 9⅓-inch modular units

From the new 9⅓-inch units to the dependable electrical components, the new Westinghouse control center is designed to meet your present requirements and future needs. Both the 14-inch and 9⅓-inch units can be quickly interchanged within a standard structure.

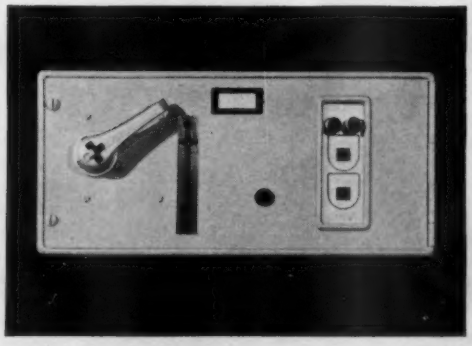
Fully interchangeable with the old design, this new control center is available for front mounting or back-to-back mounting . . . in same structure with common vertical bus. Everything about this new Westinghouse unit says good design, safety, and versatility. And you have the advantage of dealing with one source to supply all components. Call your Westinghouse sales engineer for all the facts. Or, write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. Ask for B-6722. J-21941

YOU CAN BE SURE... IF IT'S

Westinghouse

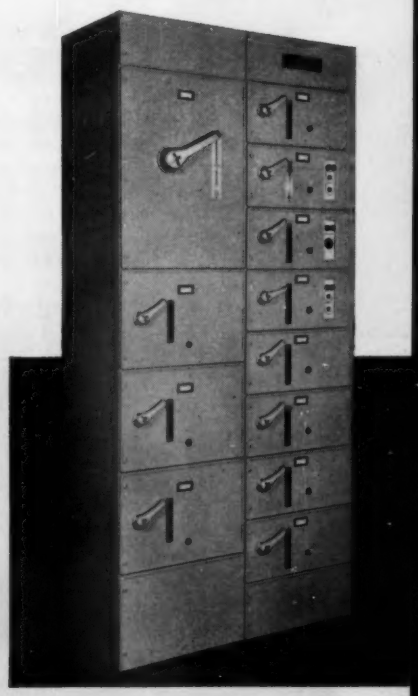


Slight Movement of Retaining Clips . . . and horizontal starter unit support bar can be moved to any position for interchangeability of 9⅓- or 14-inch Westinghouse modular units.



Door Cutout makes it unnecessary to change door when changing pilot device arrangement. Quick-make, quick-break, positive-action, modern pushbuttons in strong molded case take up less space.

For more facts circle 525 on Reply Card



Here Is Complete Flexibility . . . of structural units and electrical components. Each vertical structure holds from one to eight, front only, or up to 16 back-to-back units, to meet all needs.

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Dye Waste Heats Make-up Water

By pumping hot dye waste through a heat exchanger at the American Thread Co., New York, the temperature of fresh make-up water is raised, thus saving fuel and steam.

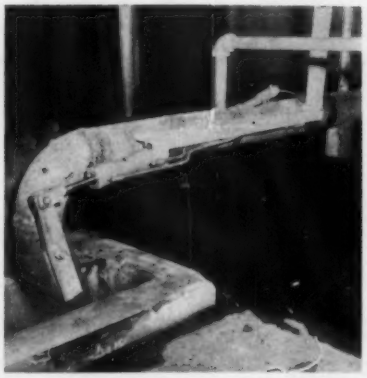
Only about half the dye waste is hot enough to use economically, the remainder being sent directly to the drain. An automatic control system makes the decision whether the dye waste should be sent to the heat exchanger or to the drain.

A divided trench was built to receive the waste water from the dye vessels. One section carries waste water to the heat exchanger, the other leads to the drain. In order to send the waste to the correct trench, a piece of ordinary pipe leading from the waste water discharge line was installed over the trench so that it could pivot. It can be positioned by the stem of the piston in an air cylinder.

Units used in the installation were a temperature controller inserted in the waste water discharge line and a four-way solenoid valve on the controlled air line to the air cylinder. The mercury switch of the temperature controller is connected to the four-way valve, two ports of which are connected to the opposite ends of the air cylinder.

The control point setting for the temperature controller is adjusted to the minimum temperature at which the waste water can be used in the heat exchanger. When the water is at or above this temperature, the switch closes the circuit to the solenoid valve, which then passes air through the port that is connected to the right side of the air cylinder. The piston moves to the left, thus placing the discharge end of the pipe over the side of the trench that leads to the pump and heat exchanger.

When water temperature is below the control point setting, the switch breaks the circuit to the solenoid valve. The controlled air passes through the second discharge port to the left end of the cylinder. Air remaining in the right end bleeds through a fourth port in the solenoid valve. The resulting movement of the piston from right to left, swings the discharge pipe to the drain side of the trench. *From Industrial Control News, published by Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.*



Controls automatically swing dye vessel discharge pipe to heat exchanger or drain depending on temperature of water

Portable Sand Blasting Unit Removes Scale From Coils

Some 37 large air conditioning units installed in our plant are of the evaporative condenser type which are subject to build-up of scale in the coils.

A small portable sand blasting unit for descaling the coils has been designed and built by two plant mechanics, J. C. Tatum and E. J. Conner. Sand is poured into the hopper and fed to the nozzles through a hose, then is forced under high pressure against the pipes. It is used over and over again. This has proved the best method of cleaning the coils yet tried.

Since it was found that the scale on the coils caused an increased power consumption of 30 per cent, it is expected that the saving on power and water costs will amount to $30,000 per year. *From Southern Star, published by Lockheed Aircraft Corp., Marietta, Ga.*

Shop-built sand-blasting unit descales coils of the air conditioning equipment

Recognizing Corrosion

Occasionally pump parts fail after a short length of service, due to corrosion or erosion. In either case, a change in metals is indicated. To determine correctly the type of attack on a damaged part, all surfaces must be inspected, including casing and suction cover in both high and low velocity regions. Areas of greatest corrosion should be noted, especially at points of contact of dissimilar materials.

The impeller should be inspected inside and out. Presence of pitting on impellers does not necessarily indicate corrosion as this could occur due to cavitation or excessive air. If this is so, pitting will be localized on the working side of impeller vanes, rather than generalized on the impeller vanes and shrouds.

In addition to the types of corrosion shown in the table, combined corrosion and erosion may occur. For example, most neutral and alkaline waters cause a rust or oxide film to form on iron. This film protects the iron underneath from further corrosion. However, if erosion occurs due to high velocities in the impeller or due to the presence

Plus factory trained engineers & technicians to assist you in selecting the types best suited to your needs*

There are more than 17,000 items in the Crouse-Hinds line of Condulet® and floodlighting equipment. Each is designed with some specific advantage or quality that makes it best suited for a particular application.

Of course, no engineer, electrician or contractor with a regular job to do, could possibly keep in mind all the pertinent data and information concerning each of these items. That's why Crouse-Hinds maintains a factory-trained field staff of 80 graduate E.E.'s and technical men.

Their job is to confer with the users of Crouse-Hinds equipment and to point out the reasons why certain Condulet equipment or floodlights are better suited for a particular job than others. With a broad grounding in the details of the National Electrical Code and a trained alertness for spotting explosion hazards in unsuspected places, they make a consulting or factory-engineer's job less onerous.

Their service is prompt and without obligation. Naturally they usually work on jobs of sufficient size to merit top-level attention, but even a small job with a large problem gets the same careful appraisal. If you'd like to talk or correspond with such a specialist, just write, wire or phone.

CROUSE-HINDS COMPANY

*Dust-ignition-proof

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Crouse-Hinds Company of Canada, Ltd.: Toronto, Ont.

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For more facts circle 526 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

Table 1. Identifying types of corrosion

Corrosion	Identification
Galvanic	Localized deep grooves or pits, usually at contact of two dissimilar metals
Uniform	Uniform attack or corrosion —may be on only one part
Intergranular	Attack at the grain boundaries
Pitting	Frequently rapid and deep pitting at several small areas. May be quite uniform or highly localized

of air or vapor, the rust film is removed, leaving bare metal in contact with the liquid. Constant rusting and erosion soon result in deep grooves and possible destruction of the metal. *From Goulds News, published by Goulds Pumps, Inc., Seneca Falls, N.Y.*

How To Rent an Air Compressor

RENTING AN air compressor can give extra capacity for short-term jobs or peak-load periods; make equipment available without large capital outlay; continue operation while regular compressors are down for maintenance or repair; and help in finding the right unit capacity and make for the job.

On a government or short-run contract that probably will not be renewed, or with a peak load once a year or at some other regular interval, renting a compressor may save money since units will not be idle for long periods.

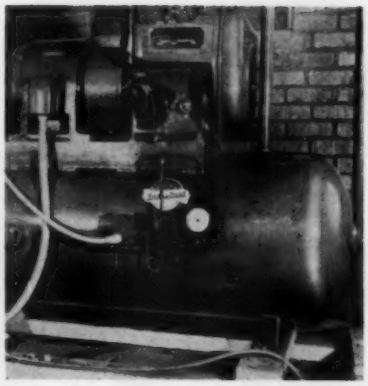
If your available capital is not sufficient to purchase a needed air compressor, you can rent a unit. Should you decide to purchase the compressor at a later date, a major percentage of the rent paid can usually be applied to the purchase price.

Production. During maintenance or repair of your compressors, you can eliminate the loss of all or part of your compressed air capacity by renting a unit. A portable or stationary compressor will keep plant operation at normal during the down-time of the regular units.

Testing. Purchasing one or more compressors to study a new process or idea might be a mistake until the correct pressure, capacity, type and location for the unit have been determined. Renting a compressor will enable you to evaluate such factors properly.

Where to Rent. In renting a compressor, the usual procedure is to contact the local distributor for the make of unit you have in mind. The method of renting and leasing varies from one distributor to another.

Rental Rates. Rates vary with locality, type of rental and use of compressor.



Rented compressor is mounted on skids

An important factor to consider in renting a compressor is its installation cost. A large sum of money expended for setting up the equipment might wipe out the advantages of renting.

Purchase. A resale price is usually established by the distributor when the rental terms are set. If the unit is new, it carries the list price. If in rental service previously, the price is less than for a new unit. All calculations are based on the price established before the unit is delivered to the user. It is necessary to have competent legal advice before entering an agreement to rent an air compressor.

Maintenance. Responsibility for maintenance of the compressor should be

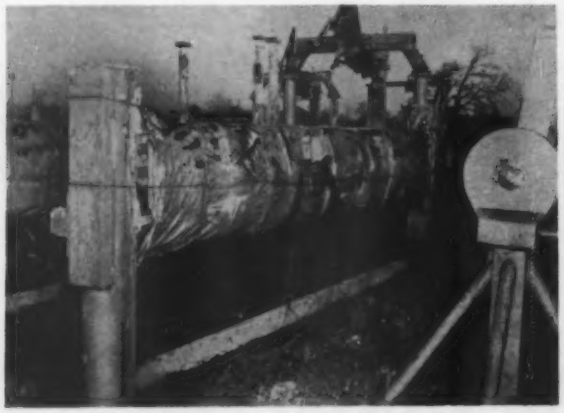
(Continued on page 42)

Metal Fixtures Stored Outdoors Stay In Top Condition With Aid of Special Coatings

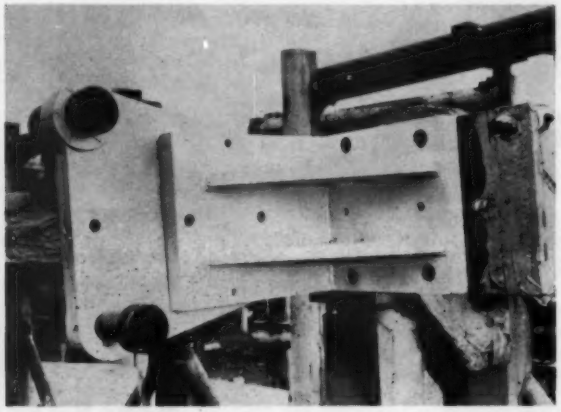
FOR LACK of indoor storage space, expensive equipment, including metal jigs and fixtures, is stored in outdoor "graveyards" at Grumman Aircraft Engineering Corporation, Bethpage, N.Y. Since the equipment is subject to the corrosive forces of the sea air which blows over the plant, each pipe used to be wrapped in a cumbersome, sealed cocoon, which was a temptation for probing fingers.

Now, the cost of this wrapping has been virtually eliminated by applying a wash primer and top coating, based on vinyl resins, to the equipment. One of the vinyl-finished fixtures is in first-rate condition after a year outdoors.

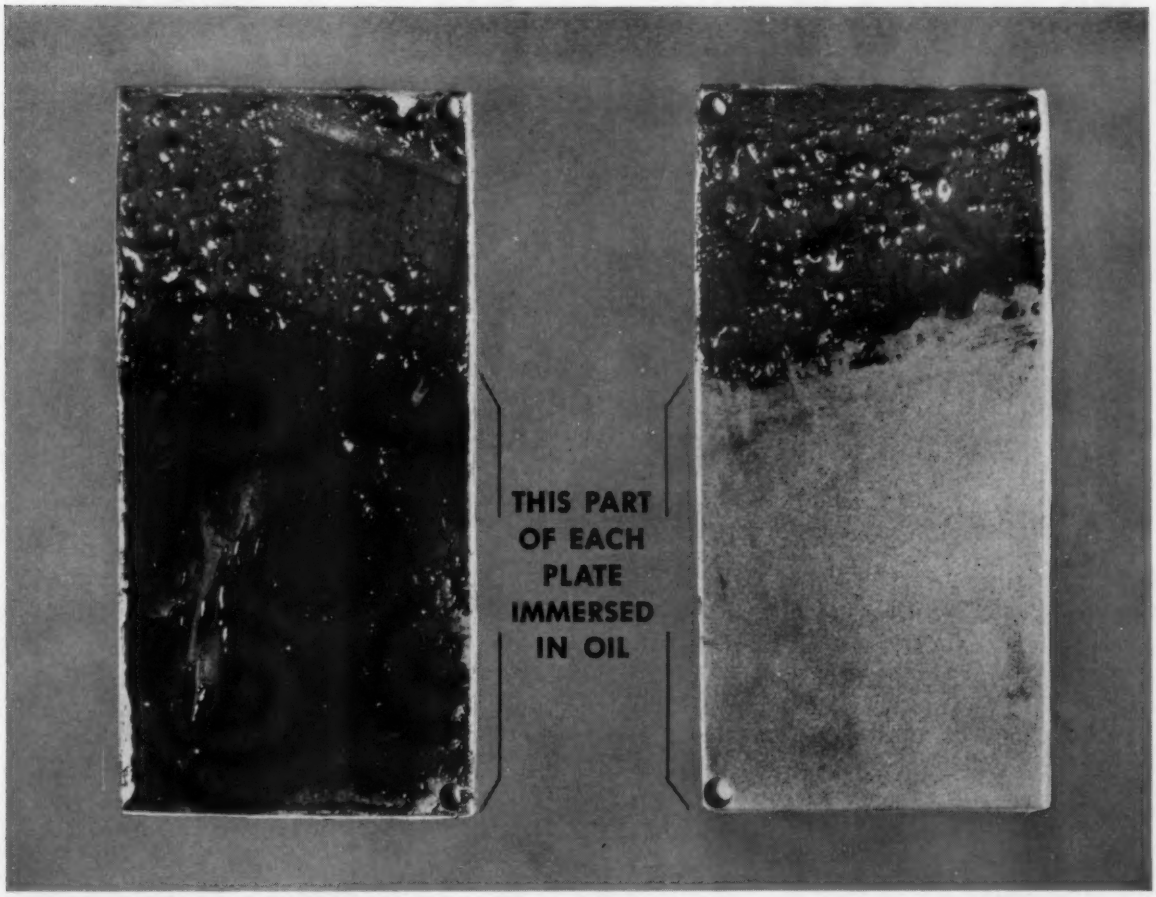
The coatings, some of which are permanent, some strippable, are also being used in the plant to protect roof-top ventilators and other equipment subject to corrosion. *From a release of Bakelite Co., Div. of Union Carbide and Carbon Corp., New York, N.Y.*



This is how equipment was stored in outdoor "graveyards"



Vinyl-based coatings now protect equipment from all weather



This sludge-coated metal plate was partially immersed in a beaker containing a *regular hydraulic oil* heated to normal operating temperature. Though the oil was agitated throughout the test, nearly all the sludge remained on the plate.

This similarly sludge-coated plate was partly immersed in a SUNVIS 700 oil, also heated to normal operating temperature. During the same period, with the same degree of oil agitation, the immersed part of the plate was rinsed clean of sludge.

Simple test shows how

SUNVIS 700 OILS CLEAN HYDRAULIC SYSTEMS...WITHOUT SHUTDOWNS

Sunvis® 700 oils clean while they work. Their cleansing action removes deposits in systems contaminated by dust, sludge, varnish, and other foreign materials.

SUNVIS 700 oils carry these contaminants in suspension for easy removal. This eliminates costly teardowns. Systems stay clean. In addition to being ideal for hydraulic systems, SUNVIS 700 oils are also suited for circulating systems and gear boxes.

If you want exceptional cleaning ability, oxidation stability, rust prevention, film strength, you need SUNVIS 700 oils. Ask your Sun representative for full details, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. PY-6.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

SUNOCO

©Sun Oil Co., 1957

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What other belting in your mill can meet all these drive conditions?

DRIVES WHERE YOU NEED MORE CAPACITY

Tannate with its high overload capacity is the economical way to get more production from your present equipment and, you'll make savings in power costs, too. It's the glove-like grip and higher tensile strength of Tannate that enables it to outproduce and outlast the ordinary belt. Try it and see for yourself.

DRIVES SUBJECTED TO HEAVY SHOCK LOADS

Tannate is resilient, absorbs heavy shock loads and acts as a cushion between motor and machine. This extra strength, built into Tannate flat leather belts, means longer service life—less maintenance, too.

HIGH SPEED DRIVES

where belt speeds as high as 6000 f.p.m. are required. Tannate can do a good job because it is comparatively light in weight—consequently centrifugal force has less effect—the power transmitting efficiency of Tannate is maintained.

MULTIPLE PULLEY DRIVES

Tannate is flexible—can take the twisting and turning of serpentine drives, mule drives and quarter turn drives. In addition, Tannate has the necessary high coefficient of friction (on both sides of the belt) to maintain high operating efficiency on the tough drives.

SHORT CENTER AS WELL AS LONG CENTER DRIVES

The superiority of Tannate on long center drives is almost taken for granted by many plant engineers today—but don't overlook the advantages of Tannate on short center drives, too. While the Tannate short center drive usually does require a tension-controlling motor base for best performance, it is equally true that this simple sturdy drive will be more efficient—do a better job, require less maintenance and last much longer than ordinary short center drives.

What is Tannate?

Tannate is the trade name for the *special tanned leather* developed and produced by J. E. Rhoads and Sons especially for the manufacture of flat leather belting. It combines exceptional grip, pliability, elasticity, strength, and durability. It will resist moisture, mineral oils and the fumes of most acids—will withstand high temperatures (212°F. dry, 170°F. moist). For specifications of Tannate flat leather belting and Rhoads' other leather products, write J. E. Rhoads and Sons, 2100 W. 11th Street, Wilmington 99, Delaware.

WILMINGTON
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RHOADS
INDUSTRIAL LEATHERS

For more facts circle 528 on Reply Card

PLANT ENGINEERS' DIGEST

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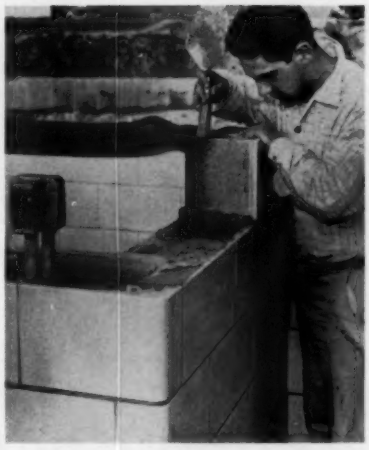
defined in the rental agreement. Normally, the user must maintain the unit at his own expense. There is, of course, the normal guarantee period during which both the manufacturer and distributor give the usual service connected with this type of equipment. Careless or incorrect application of unit by the user is his responsibility. *Types of Compressors.* Both direct and V-belt-driven units from ½ to 150 hp are suitable for rental and are produced by most manufacturers. Industrial compressors, with normal ratings running to 50 hp, are especially suitable for renting since they are easily shifted from one location to another. *From a release of Schramm, Inc., West Chester, Pa.*

All-In-One Building Block



Concrete building blocks with colored, glazed finish are used to build two-layer heavy duty wall, glazed on each side. Formerly, additional layers were required. (From Reporter, published by Rohm & Haas Co., Philadelphia, Pa.)

Stack Effluent Solids Reduced

Two STACK SPRAY installations in heating plants in the Pittsburgh, Pa. area, have reduced the amount of stack solids emitted, in one case by 70 per cent.

At the Charleroi-Monessen Hospital, the installation was made using our specifications. The spray nozzle is located 16 ft above the breeching, a distance equal to the stack diameter plus 2 ft. The spray is operated by opening a valve in a one-inch water line. With this system, 70 per cent more stack solids are removed from

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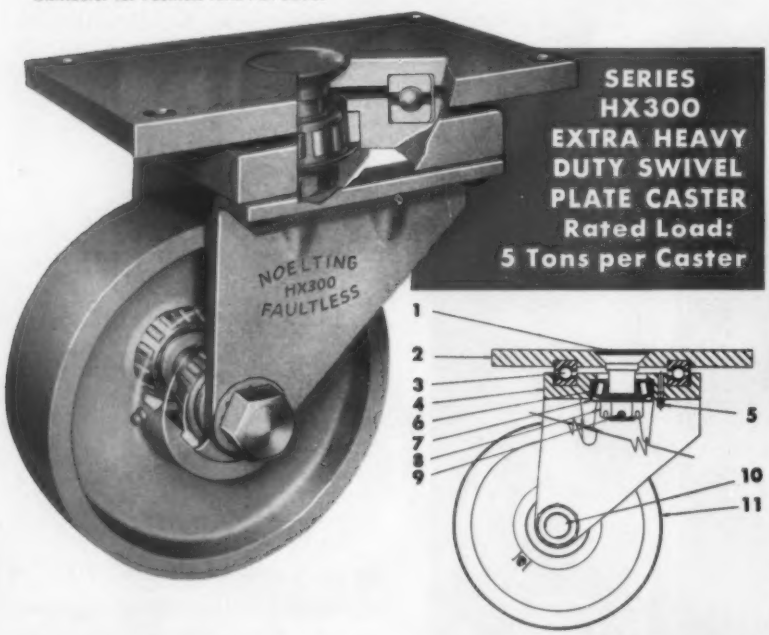
EXTRA HEAVY DUTY SERIES HX300

Faultless CASTERS

Move Maximum Loads with Minimum Manpower

Here is the super-strong Caster you have wanted for handling those loads that broke down ordinary Casters. Faultless Engineers combined their finest materials and designs to provide a caster capable of easily rolling under 10,000 pounds without injury. Under heaviest rated load conditions the new HX300 Caster keeps production lines moving with minimum handling costs. This heavily proportioned Caster has extra strength features at vital points, combined with ideally-suited bearing style and construction at all moving points. Timken tapered roller bearings and self-contained ball bearings provide free swivel and rolling movement even under loads of 5 tons per caster.

To get the complete story on the Series HX300 Caster, ask your nearby Faultless Industrial Distributor for Faultless form No. 6256.



1. HEAVY, 1" DIAMETER KINGBOLT . . . threaded and double cross-hole drilled for adjustment with each 30° turn of slotted nut.
2. ⅜" THICK, STEEL TOP PLATE . . . accurately machined to receive self-contained main load bearing.
3. ½" DIAMETER, HARDENED BALLS . . . ground and hardened raceways. Completely dust-proof.
4. SOLID-STEEL 1" THICK LOWER TOP PLATE . . . accurately turned for self-contained ball race. Horn members are heavily corrugated for extra strength.
5. EASY, FAST LUBRICATION . . . through pressure grease fittings.
6. INTERCHANGEABLE, TIMKEN LOAD BEARING . . . seats in machined recess in horn top plate.
7. COMBINATION DUST-GUARD AND GREASE SEAL . . . fully protects lower bearing from dirt, water and chemicals, and retains lubricant.
8. ADJUSTABLE, SLOTTED NUT.
9. HEAVY STEEL COTTER-PIN.
10. 1" DIAMETER AXLE BOLT . . . equipped with heavy nut and lock washer.
11. REINFORCED 8" OR 10" SEMI-STEEL WHEEL . . . Timken bearings protected with close fitting dust caps. V-Grooved wheels also available.

FAULTLESS CASTER CORPORATION
EVANSVILLE 7, INDIANA

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PLANT ENGINEERS' DIGEST

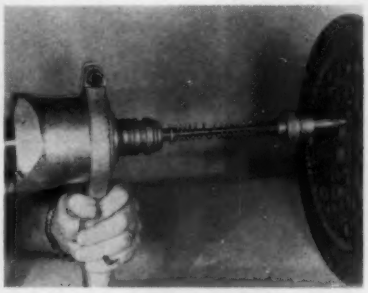
(Digest begins on page 38)

the effluent than previously. Two ram side-dump under feed stokers using approximately 1,237 tons of coal per year are in operation in the plant.

The second installation is in the heating plant at Pottsdown Children Wear, Pottsdown, Pa., which contains two 350 hp water-tube boilers, one hand fired, the other spreader stoker fired. The plant uses about 900 tons of coal annually. Total cost of installing the stack spray was $35.00. *From Bituminous Coal Research, published by Bituminous Coal Research Inc., Pittsburgh, Pa.*

Tube Rolling with Minimum Effort

WHEN A LARGE number of condenser or evaporator tubes have to be expanded, the operator has to push the expander cage forward on the



Use of spring eliminates need for constant repositioning of expander cage

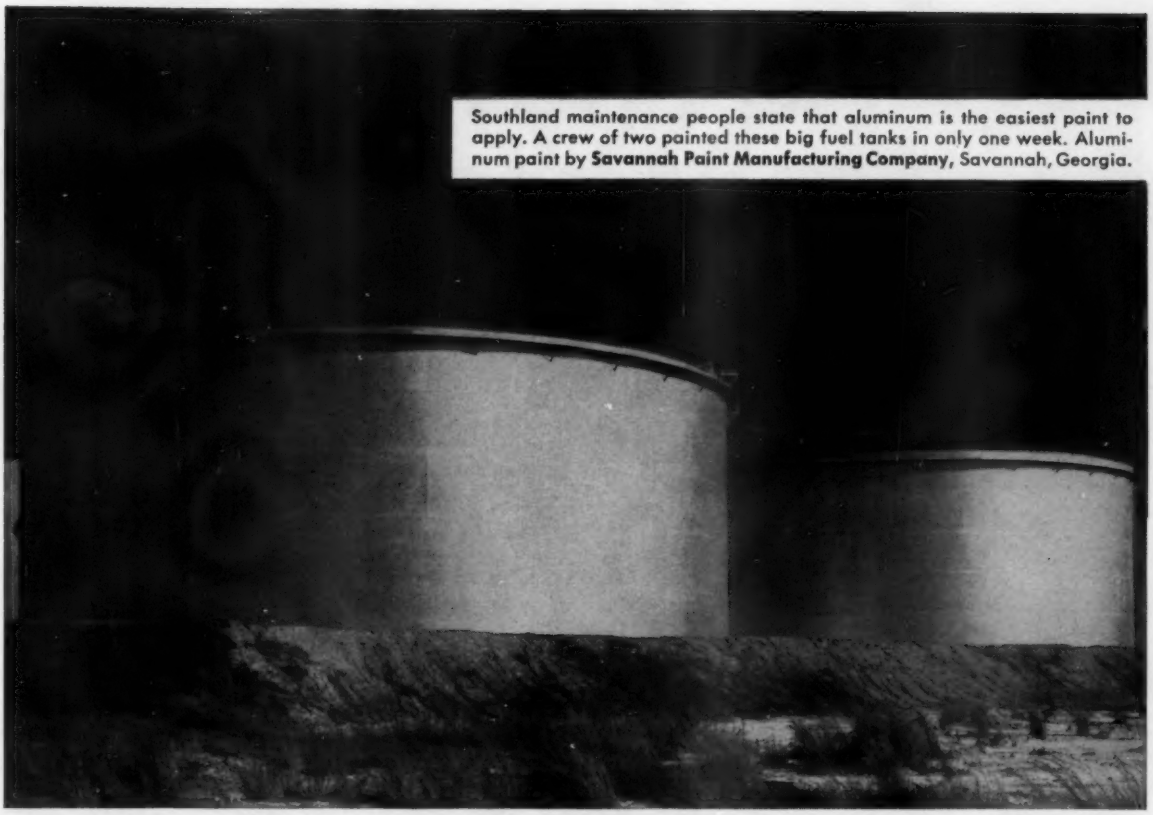
mandrel each time he finishes expanding a tube.

To eliminate this wasted effort and time, a light coil spring should be inserted between the ball-bearing collar of the expander and the head of the mandrel. The spring will cause the expander cage to come forward automatically when the expander is removed from the tube, so that there is no need for repositioning by the operator.

The spring will not cause the assembly to come apart, but care should be taken that the "pile-up" or compressed dimension of the spring is not so great that it restricts the required forward motion of the mandrel. *From a release of Thomas C. Wilson, Inc., Long Island City, N. Y.*

Model Control Room

PERSONNEL WHO will run the control room in the new Meramec power generating plant, which will be opened



Southland maintenance people state that aluminum is the easiest paint to apply. A crew of two painted these big fuel tanks in only one week. Aluminum paint by **Savannah Paint Manufacturing Company**, Savannah, Georgia.

no sign of deterioration on aviation fuel tanks after three years in corrosive atmosphere

Savannah aluminum paint cuts maintenance costs

Southland Oil Corporation reports reduced maintenance costs at its aviation fuel tank installation in Savannah, Georgia. Coated three years ago with Savannah Aluminum Paint for metal surfaces, a long oil Alkyd type using ALCOA® Aluminum Pigment, these tanks look like new today—show no sign of surface deterioration. This is significant, considering the highly corrosive atmosphere caused by the surrounding industrial community, which includes a paper pulp mill, a gypsum processing mill and several fertilizer plants.

The old paint maintenance schedule has been thrown away—nobody will guess when repainting will be necessary. But, under similar conditions, good aluminum paint has remained sound and protective fifteen years.

Reflective aluminum paint, best for exposed metal surfaces, is the preferred coating for outdoor tanks—water, oil, gasoline, propane. Because aluminum paint turns back 70 per cent of the sun's radiant heat, tank interior temperatures are lowered, evaporation losses are reduced.

ALCOA does not make paint, but ALCOA Aluminum Pigments are used in more aluminum paints than any other brand. Special formulas have been developed by your paint manufacturer to solve individual problems. Paints made to these formulas actually cost less, last longer, give utmost protection against heat, cold, sun, rain, smoke and fumes.

Write today for our two FREE booklets, *Painting With Aluminum* and *Aluminum Asphalt Roof Coatings Make Time Stand Still.* They contain valuable, up-to-date information on all types of aluminum paint and aluminum asphalt coatings. Use the coupon.

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SLY DUST FILTERS

Roof-mounted Sly Filters take up dust created by drilling, tapping and machining of cast iron engine heads.

Save Heat... Keep Engine Plant Clean

Six Sly Dust Filters at this new automobile engine plant exhaust metal dust from cutting tools, with these results:

- The building remains clean and dust-free.
- In the winter, heat savings conservatively estimated at more than $1,000 a month are realized, as filtered warm air is returned to the plant.
- Metal dust collected is automatically shaken out and carried to the main chip conveyor trenches for re-use.

This modern plant employs only the latest of techniques and equipment. Sly Dust Filters measure up because they offer important advantages in greater filtering capacity, easier bag replacement, automatic control and other features that mean low-cost operation.

Free bulletins tell why. Send for your copies today.

Designers and Manufacturers of: Dust Control Systems, Industrial Ovens, Blast Cleaning Equipment, Tumbling Mills.

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OFFICES IN PRINCIPAL CITIES

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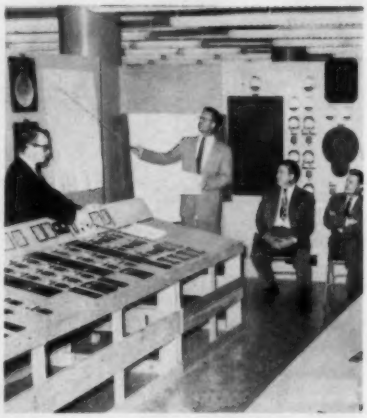
PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

in 1958, will have the opportunity to practice on a full scale model of the control room.

The wooden model, using paper replicas of the instruments and control devices, was constructed from informa-



Part of the wood and paper model control boards used in training personnel

tion supplied by the Engineering and Construction department. Its main purpose is to check and improve, if possible, the contemplated arrangement of the instruments and controls and also to help train personnel in the operation of the new unit.

The control room itself will contain four boards, each with indicating, recording and control devices. There will be a main board, bench board, mechanical board and electrical board. *From Union Electric News, published by Union Electric Company of Missouri, St. Louis, Mo.*

Conveyor System Helps Reclaim Used Parts

THOUSANDS OF DOLLARS have been saved in each of the past five years by the Norfolk and Western Railway by reclaiming roadway materials at its Roadway Materials Yard in Roanoke, Virginia.

Gondola cars, loaded with an assortment of switch stands, frogs, tie plates, spikes, joint bars, track bolts, rail anchors, etc., are pulled into the yard and spotted adjacent to a belt conveyor. A crane equipped with an electromagnet removes the material from the car and drops it on to a sloping plate. The belt, made by Quaker Rubber Div., then carries the material past a series of 21 bins where

B.F.Goodrich

New All-Purpose Pneumatic industrial tires speed operations for American Airlines

FIRST to reach an American Airlines plane after it has landed—and the last to leave before take-off—is the tractor generator (above). It supplies power to the plane while the engines are stopped. Speeding the whole operation are B.F.Goodrich All-Purpose Pneumatic industrial tires.

The new All-Purpose tread has hundreds of gripping edges that give positive traction on all hauling surfaces, indoors and outside. Because it's pneumatic, the All-Purpose gives a cushioned ride that protects floors, equipment and driver, cuts maintenance costs. Husky shoulders and a continuous center rib wear slowly and evenly, give the All-Purpose greater stability under heavy loads.

FREE TW Analysis cuts costs up to 50%

The new All-Purpose Pneumatic is just one in a complete line of money-saving B.F.Goodrich industrial tires. Picking the *right* tire for your work is the job of the B.F.Goodrich Tire and Wheel Analysis man. His unbiased recommendations can save you up to 50% on tire costs, up to 20% on maintenance costs. Countless industrial tire users have taken advantage of this FREE B.F.Goodrich service. You can too by mailing the coupon. A consulting service is available to manufacturers of materials handling equipment.

B. F. Goodrich Tire Company
A Division of The B. F. Goodrich Company
Department TW-642, Akron 18, Ohio

I would like further information on your FREE TW Analysis.

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Specify **B.F.Goodrich tires when ordering new equipment**

B.F.Goodrich
FIRST IN RUBBER

For more facts circle 533 on Reply Card

The smart way to electrify moving test lines
Here's how one manufacturer of refrigerator parts uses FEEDRAIL to provide continuous power to a test line.

ELECTRIC FEEDRAIL®

...the trolley busway that provides moving power outlets

FEEDRAIL Trolley Busways will put your testing on the same smooth, automatic basis as your regular production and assembly operations.

The reason — FEEDRAIL is a *mobile* system of electrical distribution. It consists of a series of electrified track sections from which easy rolling trolley outlets take off power and provide a continuous flow of current to the equipment being tested. This allows work to flow from station to station without interruption throughout the entire test process.

FEEDRAIL is available in capacities from 60 up to 500 amperes. Straight, curved and sectionalizing track sections allow you to meet any test requirement — any desired work flow.

GET THE FACTS

Descriptive literature containing full engineering data on FEEDRAIL Trolley Busways will be sent on request. Address Dept. P-6.

SOLD BY MORE THAN 1,000 ELECTRICAL DISTRIBUTORS FROM COAST TO COAST

Never Becomes Obsolete

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For more facts circle 534 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

workers select the reclaimable items and drop them into the proper bin. At the end of the 700-ft long run, the conveyor drops the unsalvageable parts into a scrap pile.

The conveyor can operate at speeds from 30 to 90 fpm. Normal operating speed is 40 fpm. Stop buttons installed at alternate bins halt the conveyor if necessary and it can also be run in reverse.

Used materials are moved from gondola (left) to belt conveyor (right) by crane

Salvageable parts are removed from belt, scrap is deposited at end of belt

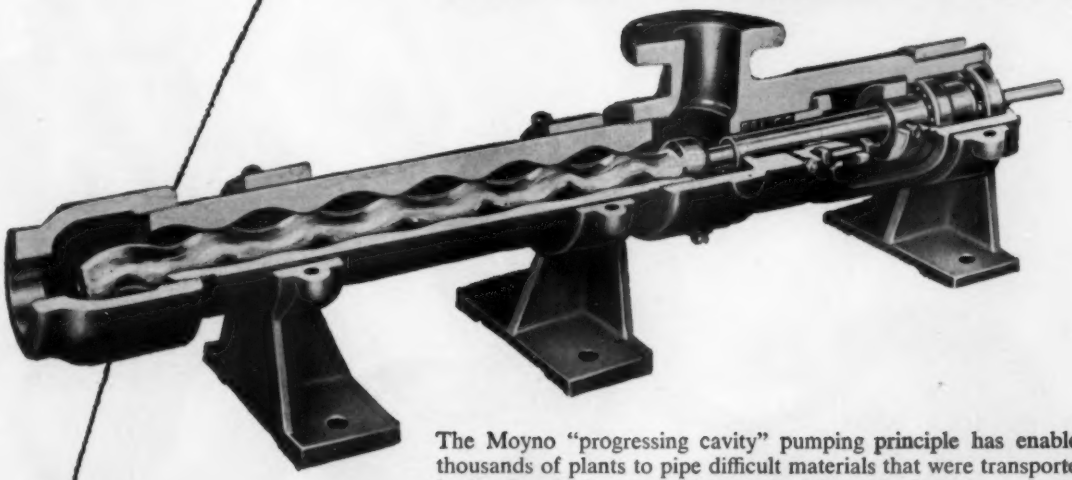
By using this conveyor system, which uses a belt almost 1500 ft long, the speed with which used materials can be handled has been more than doubled and a better job of selecting materials for re-use, reclamation or disposal as scrap is accomplished.

In addition, gondola cars used to haul material to the yard can be released faster and the hazards of removing parts from the cars by hand has been eliminated. *From Porter People, Products and Places, published by H. K. Porter Co., Inc., and its Divisions, New York, N. Y.*

from abrasive slurries to delicate foods . . .

MOYNO® PUMPS

CUT HANDLING COSTS



The Moyno "progressing cavity" pumping principle has enabled thousands of plants to pipe difficult materials that were transported by hand and other expensive means. Moyno is the only pump that can handle many abrasives, pastes, slurries, chemicals, foods, suspended solids, etc. without foaming, aerating, crushing or excessive pump wear.

As shown above, Moyno Pumps have a screw-like rotor that revolves in a double threaded stator creating progressing cavities which smoothly move material through the pump. They will pump anything that will move through a pipe . . . even plaster and non-pourable pastes!

Moyno Pumps are available in capacities up to 500 gpm and pressures up to 1000 psi.

Examine your processing methods. No doubt there are several places where Moyno Pumps can drastically cut costs. Ask us, we'll give you a frank answer. Send us an outline of your problem today! Write for Bulletin 30-PE

ROBBINS & MYERS, INC.

SPRINGFIELD, OHIO — BRANTFORD, ONTARIO

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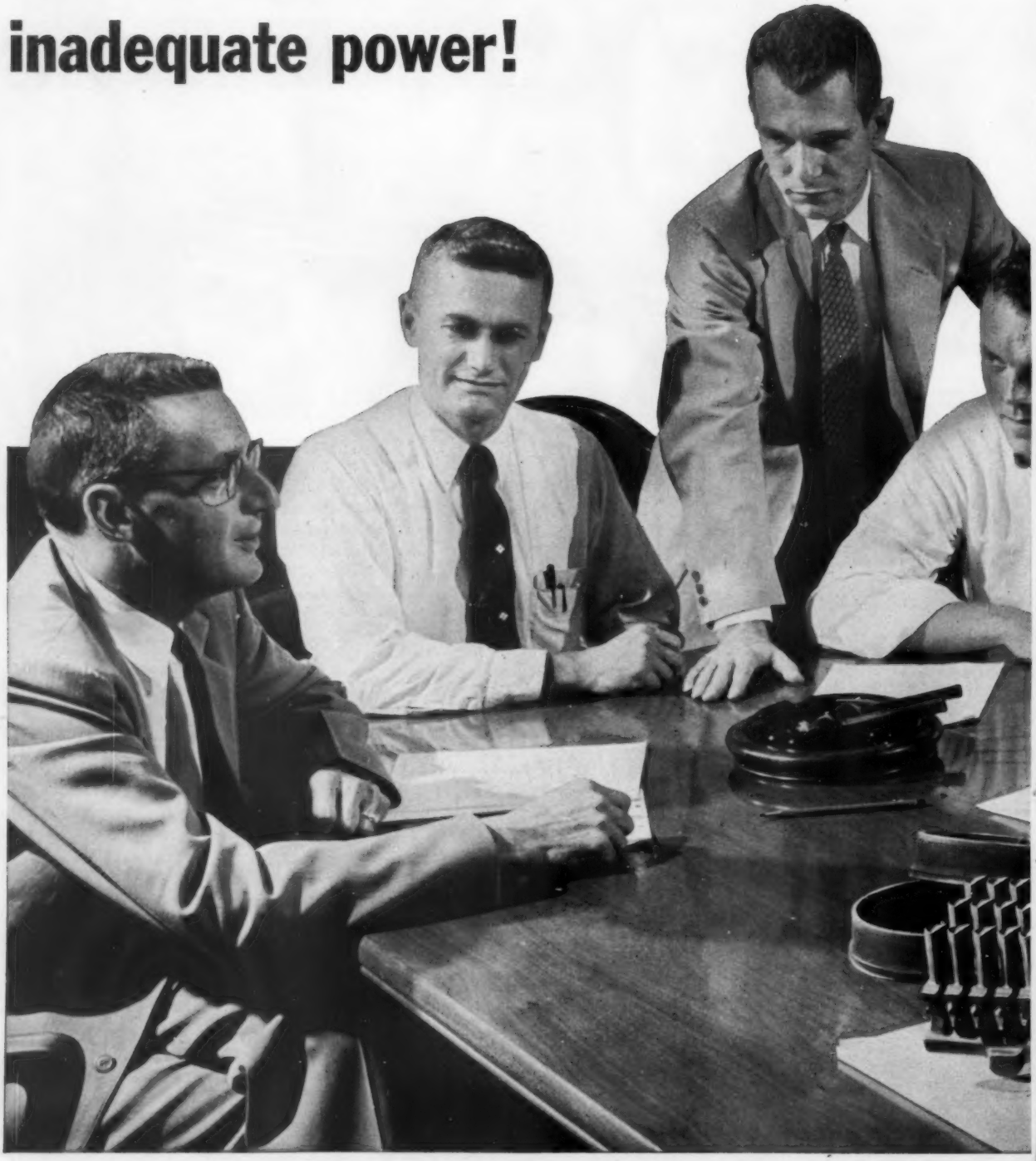
For more facts circle 535 on Reply Card

Make sure your production isn't strangled by inadequate power!

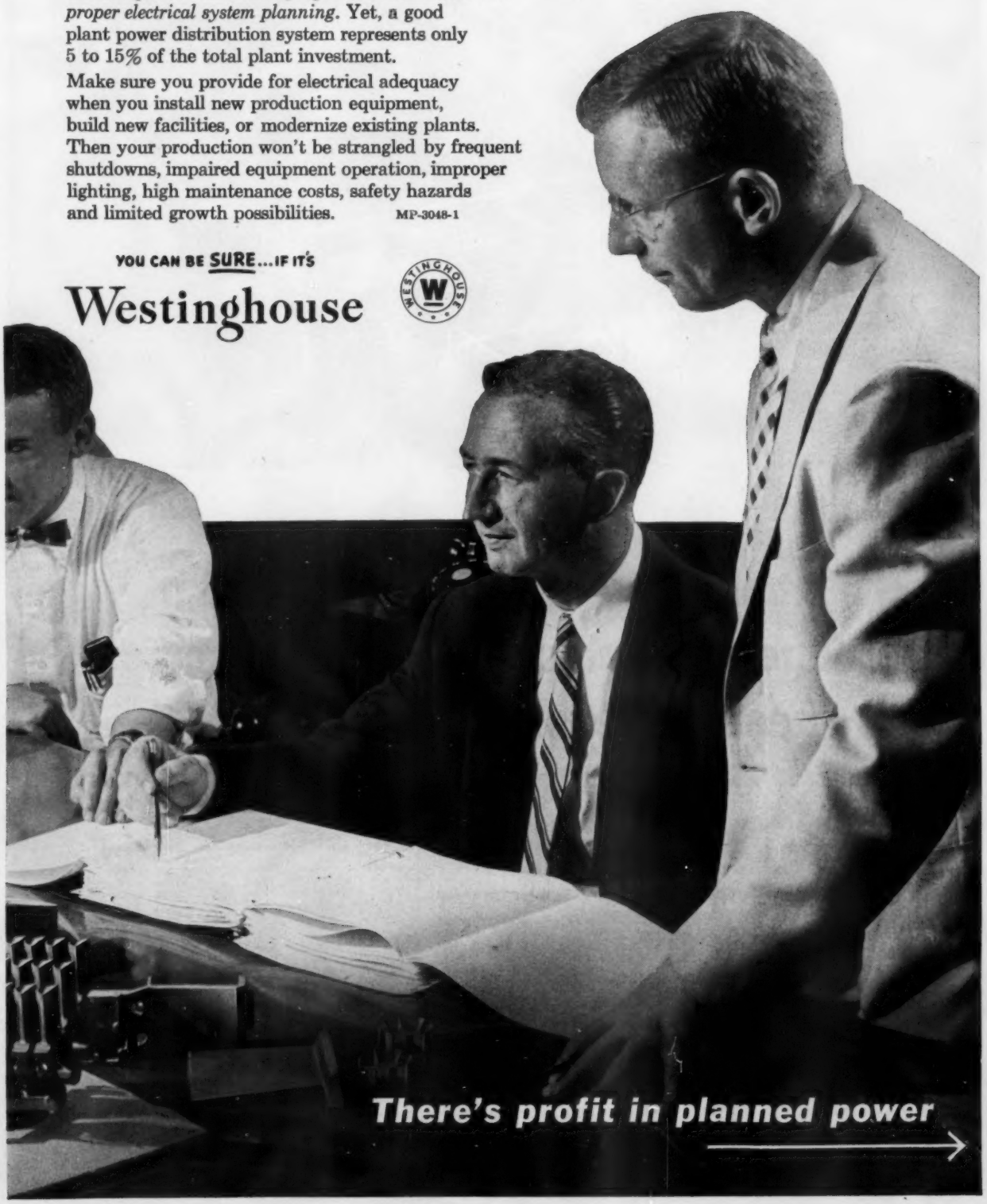


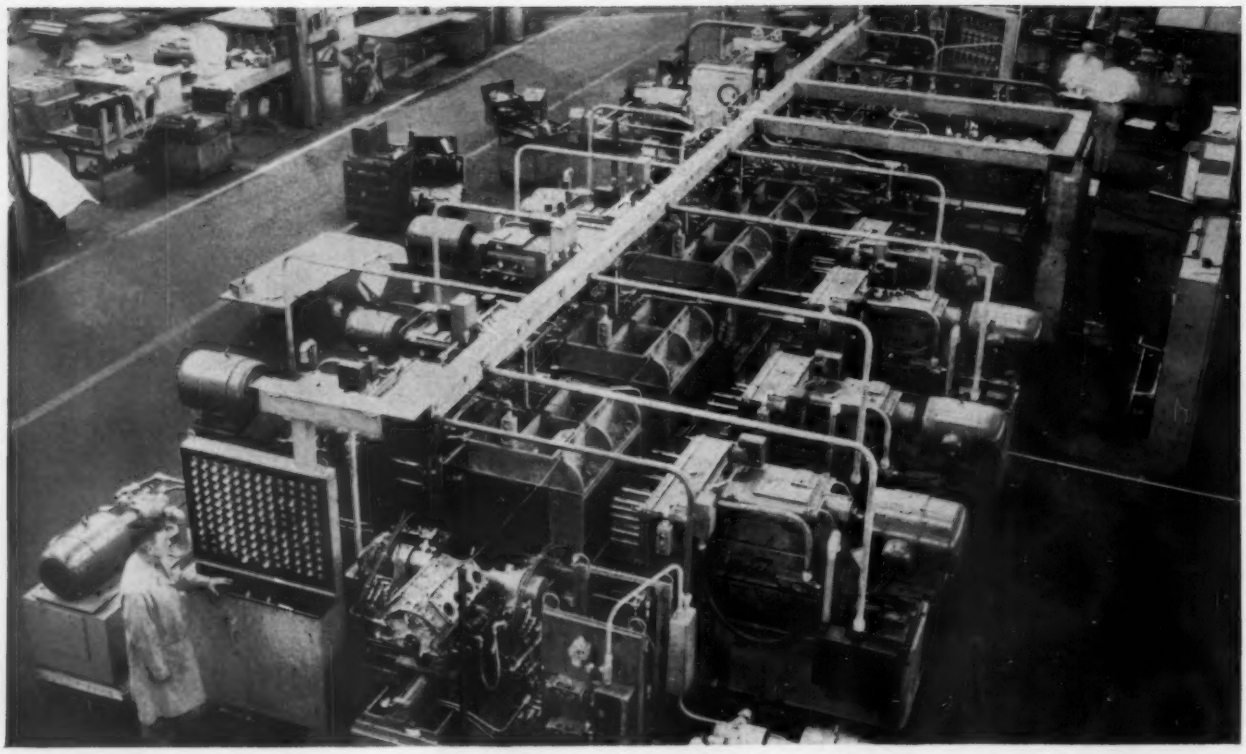
Production, marketing and financial plans are the traditional tools by which alert plant management stays competitive. Today, however, success of all three depends considerably upon a fourth factor . . . *proper electrical system planning*. Yet, a good plant power distribution system represents only 5 to 15% of the total plant investment.

Make sure you provide for electrical adequacy when you install new production equipment, build new facilities, or modernize existing plants. Then your production won't be strangled by frequent shutdowns, impaired equipment operation, improper lighting, high maintenance costs, safety hazards and limited growth possibilities. MP-3048-1

YOU CAN BE SURE...IF IT'S

Westinghouse





POWER-UP **with Westinghouse:**

make your production system more dependable, economical . . . keep it flexible, expansible

When you POWER-UP with Westinghouse, production gains in scope. Continuous power supply, coupled with constant voltage, brings new reliability to production. Provision for load growth and built-in flexibility means you're prepared electrically for years to come. Years, incidentally, that will see use of electricity increase about 8% per year. A modern distribution system also brings new advantages in convenient arrangements and easy maintenance.

Let Westinghouse help you get adequate plant power with economy and safety through proper system design and voltage, increased transformer and circuit capacities, higher interrupting capacity. There's profit in planned power—particularly if it's Westinghouse.

Characteristics of Distribution Systems

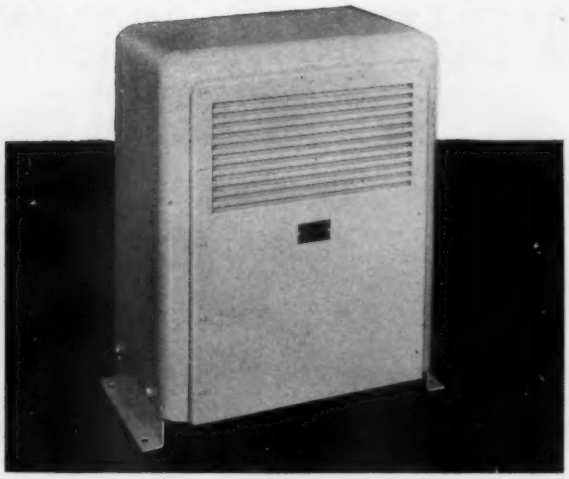
TYPE OF SYSTEM	Flexibility	Service Continuity	Regulation	Efficiency	Operation and Maintenance Cost	Initial Investment
Modern Simple Radial	F	F	D	C	A	A
Primary-Selective Radial	D	D	D	B	A	B
Simple Network	A	A	A	C	B	E
Simple Spot Network	C	A	A	D	D	E
Primary-Selective Network	A	A	B	A	C	D

LEGEND: A . . . 91-100% B . . . 81-90% C . . . 71-80% D . . . 61-70% E . . . 51-60% F . . . 41-50%

Approximate relative standing of five basic distribution systems. For detailed analysis of your system, consult your Westinghouse salesman. MP-3048-2

YOU CAN BE SURE...IF IT'S Westinghouse

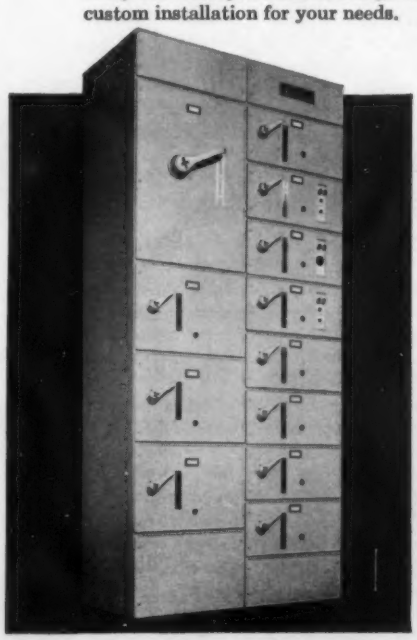
Westinghouse dry-type power centers eliminate fire hazard. Location close to load shortens secondaries, cuts line losses, improves regulation. They're 25-40% lighter than liquid filled . . . easily mounted overhead to save production space.



New Westinghouse 3-phase dry-type transformers fit easily into convenient, close-to-load points. Smaller (25-51%), lighter (17-32%), quieter (12-13 db below NEMA standard). Low case temperatures. Save 36% in installation costs.

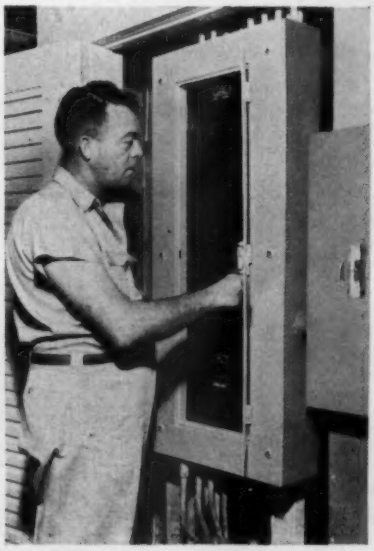
Westinghouse low-voltage, metal-enclosed switchgear has high interrupting capacity for dependable operating continuity and safety. Unitized design reduces costs, provides custom installation for your needs.

Westinghouse capacitors, used with inductive equipment, permit more of your system's capacity to carry working current. You get improved power factor, lower costs, more capacity for new loads.



New design Westinghouse control centers simplify layout, installation, service, future growth. They make possible a compact, centralized control system . . . assuring coordinated motor control and greater savings.

Coordinated design of Westinghouse AB De-ion® circuit breaker-type panelboards (right) assures positive protection to lighting and heavy power circuits. An accurate thermal-magnetic action allows full time delay on overloads, but trips instantly on short circuits.



For more facts circle 536 on Reply Card

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by Vernon T. Kempf

PVC Solves Acid Drain Problems

REMOVING WASTE ACIDS from production areas to an outside neutralizing sump system cost Machlett Laboratories, Springdale, Conn., completely new drain lines each year. The latest replacement, a piping system of rigid polyvinyl chloride installed more than a year ago, has resisted the highly corrosive acids and maintained its tensile and flexural strength.

In the manufacture of X-ray and electronic tubes, hydrofluoric, nitric, sulfuric and hydrochloric acids are used to treat and etch the glass. Each year, when the drain system had corroded under the acid flow, Machlett tried a different type metallic or cement composition piping. While resistant to some of the acids, each of the types of piping tried was subject to attack from at least one of them.

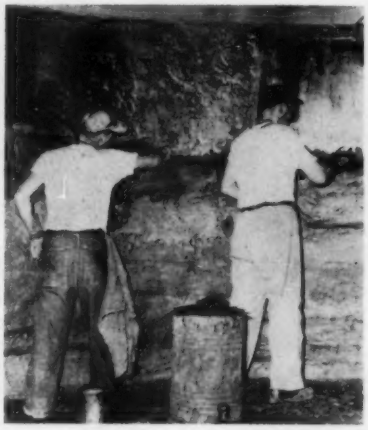
The polyvinyl chloride piping system was installed after the Walworth Company, manufacturer of both metallic and PVC valves and fittings, presented the material's excellent resistance to the acids involved. The entire run of the drain system is PVC, including the valves and fittings, to prevent any corrosion problems at the joints or flow control points. The new drain system requires no maintenance or protective coats of paint as did the previous piping.

Tank Within a Tank

Using newly developed plastic tank lining techniques, Haveg Industries, Inc., Wilmington, Delaware, can convert worthless old tanks into usable systems.

The tank lining resin plastics employed are asbestos filled phenolic or furan, graphite filled epoxy, and glass reinforced polyester. These materials will resist nearly all commercially encountered chemicals including acids, alkalis, and most organic liquids.

Lining of tanks by field molding or cementing can mean substantial savings because the cost of the tank is less; the need for razing the original tank is eliminated; and, where tanks are inside buildings, there is no need to make changes in the building's structure to permit entry or removal of large tanks.



Workmen applying plastic to inside of old metal tank to form new tank lining

Another advantage is the safety factor offered by the field fabrication of plastic. Many old industrial tanks contain fumes and corrosive chemicals of an unknown nature. Any use of welding equipment in or around such tanks could result in explosion or accidents. This danger is practically eliminated when a tank lining is molded of plastic resin.

Tanks up to 55 ft in diameter have been lined. The lining is not a coating, but in reality a new plastic tank created by using the outside structure only as a mold. This system works satisfactorily on steel, wood and concrete tanks.

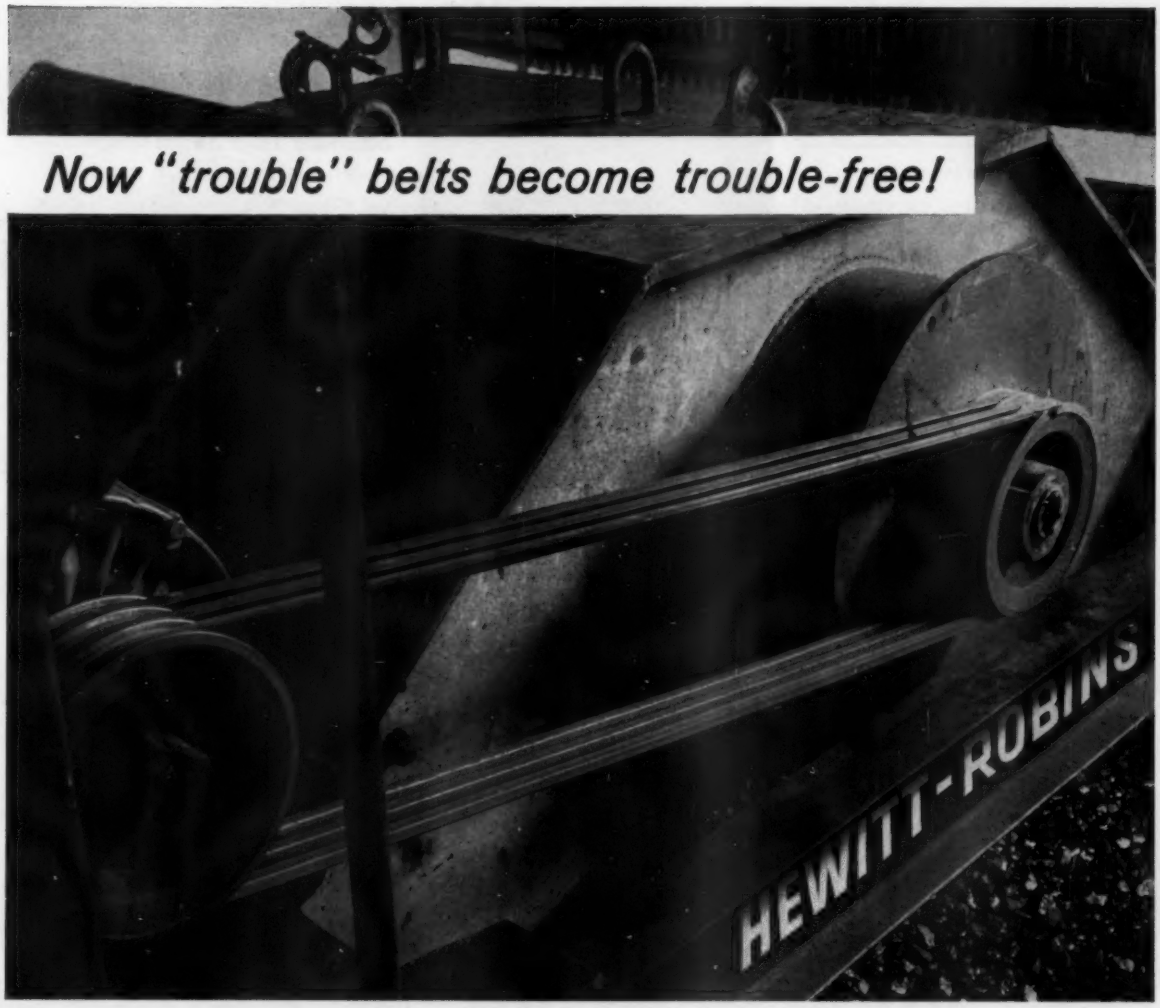
Walking Type Fork Truck Is Radio Dispatched

Radio dispatching of fork trucks has been extended to include walking types at the Smith-Corona Typewriter plant in Syracuse, N. Y. Low power General Electric industrial radio equipment is used to keep track of trucks used in the plant

Quartz Lamp Oven Fuses Gold

PRODUCTION COSTS are cut substantially for Familex Products, Ltd., Montreal, Canada, by fusing silk-screened gold lettering into flint glass bottles with a space saving radiant oven. Using a modern quartz lamp oven in its drying operations, production times of 60 to 90 minutes have been pared down to a range of 24 to 32 minutes per job.

Scientific basis for the infrared oven's increased efficiency is direct and instant transfer of radiant energy to the objects being heated. Radiant heat starts heating the entire thickness of the glass immediately, whereas the convection-type heat produced in a



Now "trouble" belts become trouble-free!

INDIANAPOLIS POWER & LIGHT COMPANY REPORTS:

Premium V-belts reinforced with DACRON last 52 times longer than ordinary V-belts on coal unloader

REG. U. S. PAT. OFF.

The Hewitt-Robins Car Shakeout in the receiving yards of the Indianapolis Power & Light Company needed new V-belts about every three weeks before its drive was switched to V-belts reinforced with "Dacron"*. In five years' operation only one belt change has been necessary—after three years' use. Despite the rugged operating conditions involved in unloading up to 30 hopper-car loads of coal a day, these belts made with Du Pont "Dacron" lasted 52 times longer than belts reinforced with conventional fiber.

The machine that uses V-belts reinforced with "Dacron" gets up to 40% more horsepower from its belt drives than is possible with other reinforcing fibers. The ability of these belts to withstand greater shock loads coupled with their longer flex life results in remarkable durability. They stretch less and are more stable than other belts . . . require far less maintenance. And design men find they can use fewer and smaller belts and sheaves, to meet today's demand for more compact, more economical belt drives.

For the next drive you design or install, consider the advantages of premium V-belts made with "Dacron". They combine the unique properties of "Dacron" polyester fiber made by Du Pont and the highest skills of leading manufacturers who make the belts. E. I. du Pont de Nemours & Co. (Inc.), Textile Fibers Department, Wilmington 98, Delaware.

**"Dacron" is Du Pont's registered trademark for its polyester fiber.*

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

V-BELTS OF "DACRON" transmit more horsepower . . . stand greater shock loads . . . give longer flex life . . . give greater opportunities for machine-design improvement.

For more facts circle 537 on Reply Card

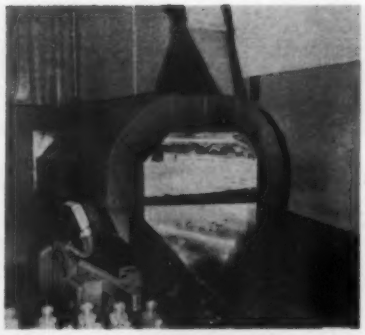
OPERATION—PRODUCTION

(O and P begins on page 54)

kiln heats the air, then the surface of the object, and must still be conducted gradually through the glass, in order to heat the entire unit.

The oven is loaded with bottles which are set on an open mesh tray. The tray is completely surrounded by an oval formed by 10 quartz infrared lamps rated at 2500 watts each. Rising heat reduces the intensity required in the upper portion of the oven so the two top lamps are connected in series. The remaining eight lamps are connected in parallel for a total oven rating of 21.6 kw.

Reaching 1150 F in ten minutes, the quartz lamp oven fires at this temperature for only two minutes to fuse the gold into the glass, then shuts off automatically for a 12-minute cooling off period. This completes the 24-minute firing cycle for six-ounce bottles.



Gold reflectors team up with infrared quartz lamps to make efficient oven

A 1200 cfm blower circulates fresh air through the oven to remove fumes, protect the wiring and burn off organic matter thus assuring a bright surface for the fused gold lettering.

Initial cost of the radiant units, products of Fostoria Pressed Steel Corp., Fostoria, Ohio, is considerably less than the cost of a kiln and no time-consuming warm up period is required.

Substitute Float Switch

Contributed by Howard T. Bailey

To REPAIR a broken float switch without a supply of spare parts we made a new switch and changed the circuit. The switch was made from two strips of brass fastened to an insulated base and bent as shown in the illustration. Two machine screws were used as adjustable contacts. The float arm becomes part of the circuit and low voltage relays were used for safety.

This is a pump-down application. As water rises in the tank, the float arm moves up until contact "A" is closed. The circuit is through line 1 to the tank, through the tank to the float arm and contact "A". This completes the circuit to relay CR1. Normally open contact CR1a closes, energizing

(Continued on page 58)

TV System Assures Spotwelding Quality Control

CLOSED CIRCUIT TELEVISION has replaced the human eye in watching spotwelding on the underside of large aluminum panels of the KC-135 jet tanker skins. The Ryan Aeronautical Company, San Diego, Calif., uses a small General Precision Laboratory TV camera to transmit a magnified report via a coaxial cable to a 17-in. monitor screen at the side of the welder.

Due to the heat and pressure necessary to accomplish spotwelds, the copper alloy welding tips soon pick up aluminum from the surface of the sheets. Since this surface forms the protective coating which prevents corrosion of the harder alloy core, it is important that this pickup be kept to a minimum and both welding electrodes be cleaned when the deposit becomes noticeable. The welder operator can constantly monitor the underside of the welds and stop the moment the first sign of electrode pickup appears on the television screen.

The TV camera is set up on an arc with simple brackets and moves to coincide with the longitudinal and crosswise motions of the panel. The camera is remotely powered and follows the line of welding in any direction. Two lenses provide either detailed close-ups of each spotweld or wide angle views. A combination of fluorescent and incandescent floods are used to assure proper lighting without reflection from the aluminum panels or the spotwelds.

Fig. 1. Operator checks enlarged 5½-in. spots on TV screen

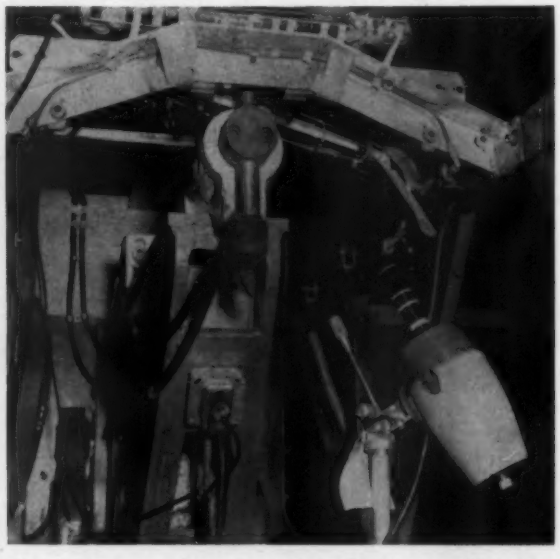
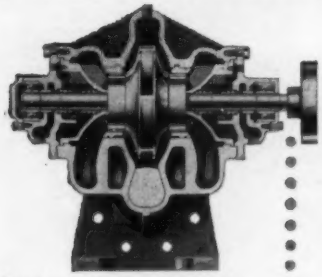


Fig. 2. Camera positioned to view underside of welded skins

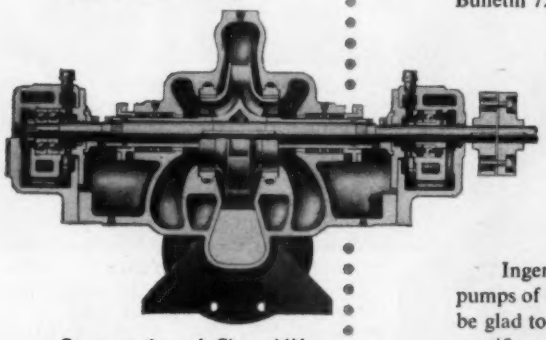
for DEPENDABILITY plus ECONOMY
..IN GENERAL PUMPING SERVICE



Cross section of Maintenance-Free class DMV and DHV pump with double mechanical shaft seals and prelubricated sealed bearings.

I-R Single-Stage, Horizontally-Split Centrifugal Pumps offer many features for trouble-free performance and low operating and maintenance costs

For capacities from 250 to 2400 gpm and heads to 350 ft., the DMV and DHV Pumps shown at the left provide important savings in floor space and virtual immunity to stuffing-box and lubrication problems. All units are equipped with double mechanical shaft seals that eliminate stuffing-box maintenance and pre-lubricated sealed ball bearings that require no attention or lubrication for the life of the pump. For complete details, send for Bulletin 7248-A.



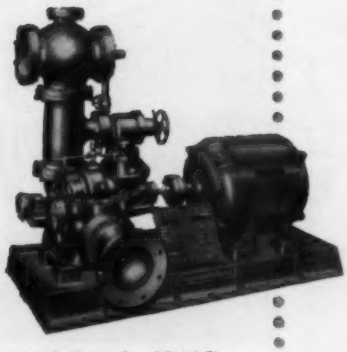
Cross section of Class ALV single-stage pump with conventional stuffing-boxes and shaft bearings.

The standard line of I-R single-stage, horizontally-split pumps, of which the Class ALV unit illustrated is typical, covers the broad operating range from 25 to 50,000 gpm and heads from 20 to 350 ft. Extra-deep stuffing-boxes are equipped with seal cages for the supply of sealing liquid from pump discharge passage or an external source. Two-piece split glands are easy to remove and replace for repacking the box. All of these pumps can be provided with any desired type of drive.

Ingersoll-Rand also offers a complete line of single- and multi-stage pumps of both the horizontal and vertical type. Your I-R representative will be glad to give you complete information on the pumps best suited to your specific requirements.

...IN FIRE PUMP SERVICE

I-R Fire Pumps have been completely approved by the National Board of Fire Underwriters and the Associated Factory Mutual Fire Insurance Companies



External view of a 5FUV Fire Pump equipped with grease-lubricated ball bearings and fire fittings.

Except for details of pump fittings, I-R Horizontal Fire Pumps are identical to the general-purpose units shown above. Fully approved for permanent installations of the hose line or sprinkler type, they provide dependable fire protection for public buildings, small cities, factories, shipyards, hotels and mines.

I-R Horizontal Fire Pumps are available, with any desired standard fire fittings, in capacities of 750 and 1000 gpm at 100 and 125 psi, or 1500 and 2000 gpm at 100 psi. Vertical Units are also available for 750 and 1000 gpm at 100, 125 and 150 psi. Send for Bulletin 7226.

Ingersoll-Rand

10-453 ♥ 11 BROADWAY, NEW YORK 4, N. Y.

PUMPS • CONDENSERS • COMPRESSORS • DIESEL ENGINES • AIR AND ELECTRIC TOOLS • VACUUM EQUIPMENT

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Drives like a nail, holds like an anchor
Shure-Set®

Maintenance jobs are easy with SHURE-SET—the hammer-in tool that sinks fasteners into mortar and concrete, as if by magic! Use no cartridge.

Eliminates drilling and plugging; no wires, no hose, no equipment to drag; completely portable . . . carry tool, hammer, and all the drive pins and studs you need, in convenient kit.

For renovating, redecorating, anchoring equipment, fastening partition plates and EVERY fastening job involving brick, concrete, masonry or light steel, SHURE-SET makes the tough jobs easy. Do in 30 seconds what once took up to 15 minutes!

SHURE-SET is baby brother to RAMSET®, the powder-actuated fastening method. Use SHURE-SET for light-duty, RAMSET for heavy-duty jobs. Catalogs are now ready. Write for literature on *both tools* today.

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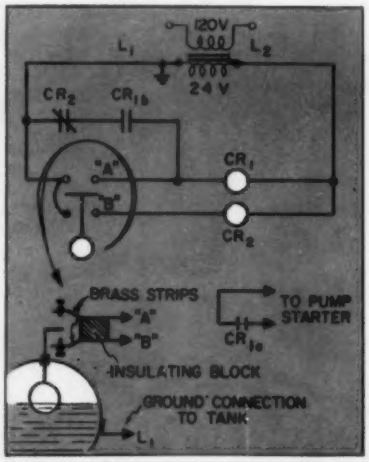
OPERATION—PRODUCTION

(O and P begins on page 54)



Substitute float switch and 24-v relays arranged for a pump-down application

the pump motor. Interlock contact CR1b closes, maintaining the circuit through the normally closed contact CR2. As the water is pumped out of the tank the float arm moves down until it completes contact "B". This completes the circuit to relay CR2. Normally closed contact CR2 opens, breaking the circuit to relay CR1 and the pump stops.

Motor Baking Oven

Contributed by H. J. Miller

DRYING OUT MOTORS can be accomplished simply and economically with this shop-made baking oven. A cement block wall about three ft high was constructed in a corner of the shop. Iron bars were laid on top of this wall and embedded in the building wall to support oven roof. Six 150

Six 150 watt heat lamps, mounted on adjustable bases, direct heat to motor

KOPPERS

announces a new member of its famous family of BITUMASTIC® coatings:

KOPPERS NO.99 INSULATING COATING

for applications requiring both

CORROSION PROTECTION *and* INSULATION!

WHAT KOPPERS NO. 99 IS: Koppers No. 99 Insulating Coating is a black mastic impregnated with cork. It was created especially for use where equipment requires both corrosion protection *and* insulation, and where potential savings in heat loss are not enough to justify expensive block-type insulation.

WHAT KOPPERS NO. 99 DOES: One application of Koppers No. 99 not only protects metal surfaces against corrosion, but at the same time furnishes effective thermal insulation. It also waterproofs, controls condensation, and deadens sound. It is resistant to acids and alkalis, and retains full efficiency through the temperature range from 250F to −40F. It may be applied winter or summer, indoors or out. It dries rapidly, is highly resistant to fire when dry, and may be painted if desired. It can be used on ceilings, partitions, air ducts, tanks, and many other surfaces.

WHY KOPPERS NO. 99 IS EASY TO USE: Koppers No. 99 Insulating Coating requires no surface priming except under unusual conditions. Uniform coatings of the desired thickness may be sprayed on in a single application, using any one of several standard types of heavy-duty spray equipment.

HOW KOPPERS NO. 99 CAN SAVE YOU MONEY: If you have equipment or surfaces requiring both corrosion protection *and* insulation, Koppers No. 99 can save you money two ways. First: it effectively performs *both* functions with only *one* investment in materials and application. And second: because this coating is *long lasting* it *costs less per year* than any other method of providing the same protection. For specifications and applications data, write: Tar Products Division, Koppers Company, Inc., Dept. 115F, Koppers Building, Pittsburgh 19, Pa.

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COATINGS AND ENAMELS

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

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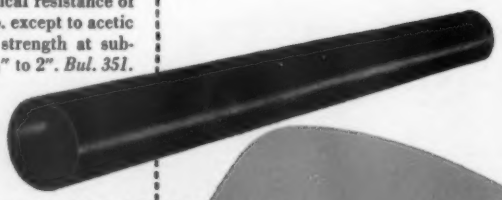
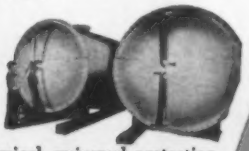
STAYS TOUGH
AT SUB-ZERO TEMPERATURES

ACE PARIAN . . . odorless, tasteless, rigid polyethylene. Best chemical resistance of any plastic at room temp. except to acetic acid. Excellent impact strength at sub-zero temp. Rigid pipe ½" to 2". *Bul. 351.*



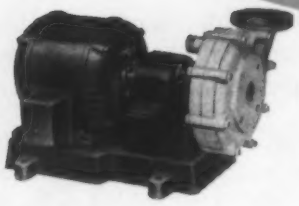
LIFE-TIME
ACID STORAGE TANKS
Rubber-lined by ACE
2-layer system



Economical, universal protection against all alkalis, metallic salts, practically all inorganic acids, hydrochloric acid any strength, sulphuric to 50%, nitric to 20%, phosphoric to 75%. Good to 160 deg. F. . . . sometimes higher. Soft rubber interlayer aids shock resistance.

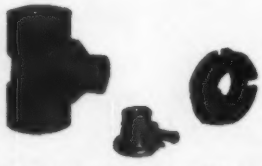
Now eleven ACE Materials to STOP CORROSION

Eleven job-proved rubber and plastic materials now available in ACE piping, valves, pumps and tanks. Tough Ace-lite rubber-plastic blend . . . Saran . . . heat-resistant Tempron . . . Riviclor PVC . . . many others. Write for comparative properties Bulletin CE-50 . . . or call your American Hard Rubber Company distributor.



ACE "WAM" . . . THE FINEST
Non-metallic Acid Pump

On job after job, this 80-gpm. centrifugal pump has earned highest praise. Hard rubber casing and impeller, Hastelloy C shaft. Handles nearly all corrosives. Mechanically simple, trouble-free. *Bulletin CE-55.* Larger ACE pumps available.



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COVERS, TANKS, PARTS?

If you want life-time corrosion protection for special parts needed in quantity . . . we may save for you by molding them of ACE hard rubber or plastics to your most exacting requirements. Our facilities among world's largest. Ask for recommendations.

ACE processing equipment of rubber and plastics

AMERICAN HARD RUBBER COMPANY
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OPERATION—PRODUCTION

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watt infra-red lamps are used to supply the heat. Asbestos covered leads from the sockets are connected to a time clock to limit the heating time. A sheet metal door is used to close the front of the oven and contain the heat. Moisture escapes through a five inch circular opening in the rear.

King Size Mufflers Reduce Noise

PIERCING EXHAUST NOISE from six turbo-supercharged engine compressors are silenced with Burgess-Manning exhaust snubbers in this installation of the Pacific Northwest Pipe Line at Durango, Colorado. The gas engines are used to power the pipe line.

Muffler (arrow) reduces engine noise. Air intake silencer is below muffler

The snubbers are of a straight-through type with low pressure drop.

Sliding Guard on Circular Saw

A SLIDING GUARD has been devised by the Reliance Picture Frame Company, Dover, N. J., for its Delta tilting arbor frame cutting saws. The guard has won a commendation award from the New Jersey Industrial Safety Commission. Twenty-four saws are used to meet daily production demands for 13,000 picture frames.

The guard consists of a piece of thick transparent plastic fastened to a piece of wood which is, in turn, attached to the miter bar slide. The guard rides forward as the operator pushes the work through the saw. A second block of wood is fastened to the free side of the plastic and rides free

Another Goodyear First:

V-Belts *with the* Green Seal

stay matched from factory to drive

The Green Seal signifies true dimensional stability. It means that now when you reach for a matched set of V-belts, you can be sure they're matched – no matter how long they've lain on the shelf. And that means longer life and a minimum of down time.

It used to be that only steel-cable V-belts by Goodyear were length stabilized. But now, through the miracle of Triple-Tempering, they've been joined by all the other Goodyear Industrial V-belts.

Triple-Tempering is the exclusive process wherein synthetic cord is carefully brought to the peak of strength and stability by controlled tempering with Tension, Temperature and Time. And this gives you not only *length* stability in storage, but greater shock- and stretch-resistance on the drive.

In addition to 3-T load-carrying members, the Green Seal also brings you "balanced construction." This means each component of the belt is specifically designed to its job to give you cleaner, smoother, longer running which adds up to maximum, trouble-free horsepower hours at minimum cost.

The next time you need V-belts, be sure they're wearing the Green Seal–the mark of a V-belt made with the technical know-how of the world's largest rubber company. They're readily available at your Goodyear Distributor. Or write for details to Goodyear, Industrial Products Division, Lincoln 2, Nebraska, or Akron 16, Ohio.

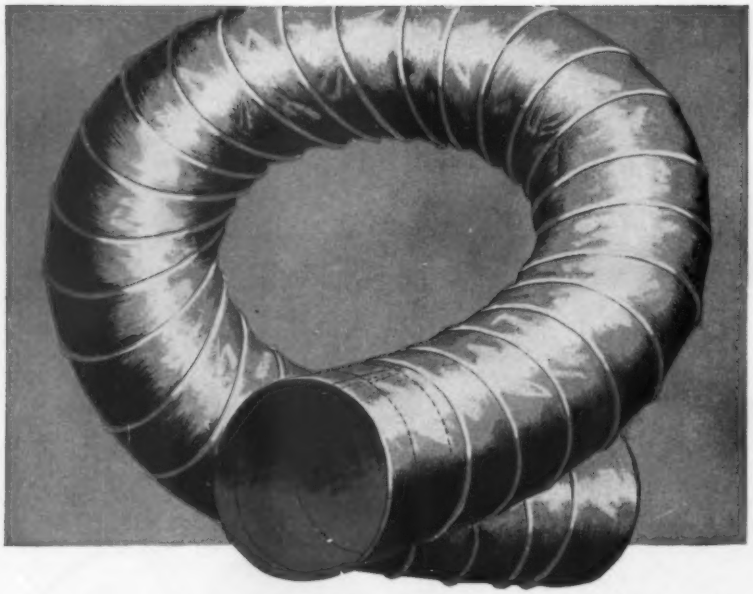
DIMENSIONALLY STABLE V-BELTS by

GOODYEAR

THE GREATEST NAME IN RUBBER

Green Seal –T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

For more facts circle 542 on Reply Card



facts about Spiratube®

that will help you solve your ducting problems

What is Spiratube?

A flexible, lightweight duct made of continuous helical coils of spring steel reinforced with overlapping plies of tough, multi-coated fabric.

What are its applications?

Spiratube is used for the removal of air, gases, liquids and many solids at low pressure. Its installation can be either portable, permanent or temporary.

How flexible is Spiratube?

It will take tight turns at any point up to 180° without buckling. No elbows or fittings are required.

How much abuse can it take?

Plenty. The fabric in Spiratube is extremely rugged. Flex tests run to 280,000 times without apparent wear.

Are there different types of Spiratube?

Yes. Five different types . . . available in a variety of covers and in sizes from 3″ to 30″ I.D.

What about installation?

Sections of Spiratube can be linked together or detached in a matter of seconds without the use of tools. If machine changes are made, Spiratube can be assembled and disassembled and re-used over and over again.

How can I make sure that Spiratube will solve my problems?

Write us, outlining your requirements. Our engineers will be glad to put their experience to work for you. Write Dept. 96.

Sold through industrial distributors from coast to coast.

Flexible Tubing
CORPORATION

GUILFORD, CONNECTICUT • LOS ANGELES 64, CALIFORNIA

For more facts circle 543 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

Fig. 1. Saw guard permits unobstructed view of work, moves on miter bar slide

Fig. 2. Guard is attached to miter bar slide with two flathead wood screws

on the table. This block shoves the short waste piece out of the way on the return stroke, preventing it from being thrown by the rotation of the blade.

Motorized Chain Hoist

Contributed by H. Muller

HERE IS A LITTLE TIP on how to solve a lifting problem that is too frequent for a manual chain hoist but does not warrant the expense of a regular electric hoist.

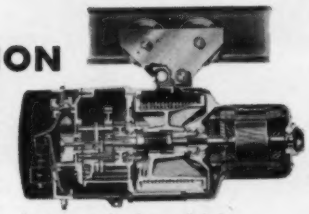
The required modifications are simple and can be performed in any shop. The pull chain is removed and a bracket fabricated to hold a ⅓ hp 900 rpm motor. The motor pulley and the hand chain pulley are connected by

For more facts circle 544 on Reply Card——➤

WRIGHT Electric Hoists / for lowest final cost

These features make WRIGHT Speedway Hoists your best buy for—

MORE PRODUCTION

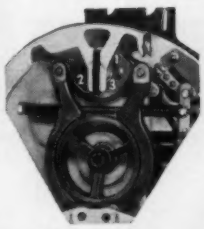


Fine balance and heavy duty design make possible the continuous handling of tough jobs on any duty cycle for which a 30-minute NEMA motor is satisfactory. All gears and pinions are alloy steel, heat-treated. Their ductile core supplies shock resistance to most severe service stresses. Anti-friction bearings throughout.

LONGER LIFE

Strength of gear teeth of WRIGHT Frame 2 and 3 Speedway hoists has been doubled by a change in contour and grain structure of the metal. Internal gear ring with heavy flanged cross section is bolted to drum at six points and provides extreme resistance to distortion.

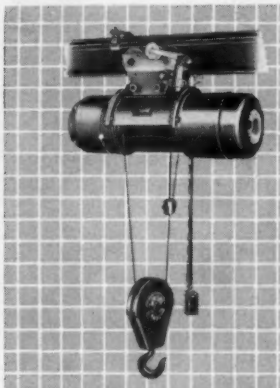
EASIER MAINTENANCE



There is nothing to adjust but the cam to keep brake in perfect adjustment. When excessive load drift occurs... remove the screw shown at Position 1, swing the cam until Position 2 is in line. Replace the screw. Position 3 is provided for the final third of brake lining wear. Brake springs and solenoid never need adjustment.

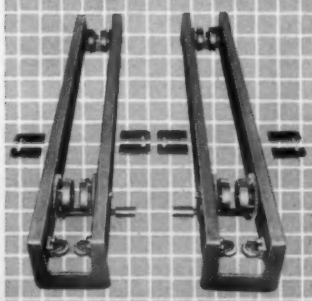
Better performance at lower cost by using WRIGHT units for local-built cranes

SPEEDWAY ELECTRIC HOIST



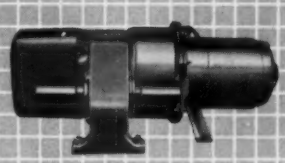
Available in Frame 1, 1½, 2 and 3 sizes with capacities from ¼ ton to 10 tons.

END TRUCKS



For motor-driven cranes and hand traveling cranes—both top running and under-hung types. Timken bearings throughout. Wide range of capacities.

CRANE DRIVE UNIT



For crane and double-beam trolley propulsion. Electric motor transmits power through fluid drive to well proportioned gear reduction. Units are equipped with WRIGHT designed solenoid "drag" brake. Size 1—with motors to 2 HP. Size 2—with 3 to 7½ HP motors.

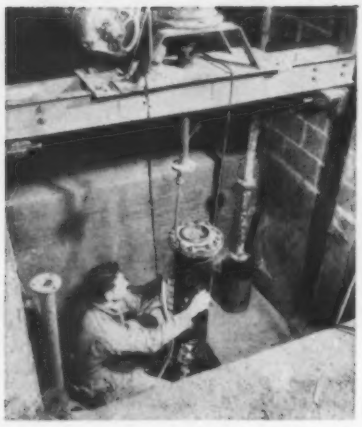
for complete information on WRIGHT Hoists and Crane components ask for: ***Speedway Hoists:*** *(Frame 1) Booklet DH133B, (Frame 2 & 3) Catalog E55A.* ***Motor Driven Cranes:*** *Underhung, Single Bridge, Bulletin #227; Top Running, Bulletins #DH448 or DH449* • ***Crane Drive Units:*** *Booklet DH-431A* • ***Hand Traveling Cranes:*** *Bulletins #DH-468 and #DH-348B*

Wright Hoist Division
AMERICAN CHAIN & CABLE

ACCO

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

CUT ELEVATOR COSTS AND MAINTENANCE



***A powerful** hydraulic jack moves and supports the modern Rotary Oildraulic Elevator from below. Here, jack casing is being lowered into hole drilled in center of elevator shaftway pit.*

***Polished steel plunger** moves up and down in casing. Elevator car is bolted to top of plunger which rises as oil is pumped into the casing. All weight rests on pit foundation, not on building walls.*

***No expensive penthouse** is required to house this efficient, compact power unit. There is no overhead machinery, no cables to wear out and be replaced. All elevator adjustments are made right here.*

EASILY INSTALLED HYDRAULIC ELEVATOR

has many advantages for freight service

- Reduced building costs
- Consistently dependable operation
- Rugged construction to withstand shocks and jolts of heavy-duty freight service
- No cables to wear out
- Capacities from 1000 to 100,000 lbs.
- Nationwide service facilities

Mail now for more information

Rotary®

OILDRAULIC® ELEVATORS

Rotary Lift Company

Division of the Dover Corporation

Memphis, Tenn.—Chatham, Ontario

ROTARY LIFT CO.
1021 Kentucky, Memphis 2, Tenn.

Send complete information on ( ) freight ( ) passenger elevators to:

*Name*_____

*Address*_____

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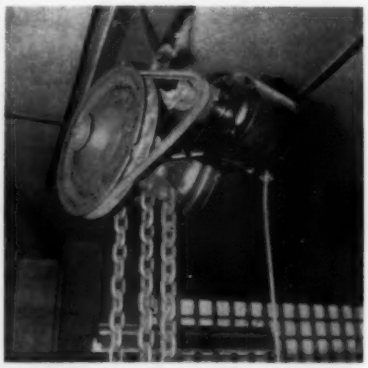
OPERATION—PRODUCTION

(O and P begins on page 54)

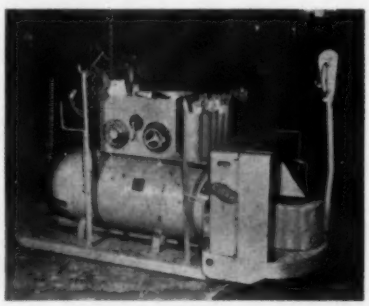


Bracket attached to chain hoist holds motor in position. Belt drives pulley

a V-belt completing the drive. A reversing switch, large enough to permit plugging, is used to provide dependable braking when lowering heavy loads.

Mobile Welding Truck

HEAVY WELDING EQUIPMENT is readily moved around the plant for on-the-spot repair jobs at Clark Equipment Company's Industrial Truck Division, Battle Creek, Mich. This



Walking-type fork truck makes self-powered welding unit for plant repairs

was made possible when the maintenance crew converted a battery-operated hand truck into a self-powered mobile welding unit.

A 450-amp welding machine, with the control panel welded to the top of the motor case, was bolted to the forks of a pallet-type truck. Angle irons and sheet steel were fabricated into a table on the front end of the unit. Five round steel containers were welded to the table to hold the welding rods.

At the rear of the unit, angle irons were set up to form a frame from which hose, clamps and other equipment could be hung.

New lithium base

GULFCROWN GREASE

...the one grease that does the work of many

It's a fact—you can use Gulfcrown practically anywhere! On plain or anti-friction bearings. In gear boxes. Outside or inside. You name it, chances are Gulfcrown will lubricate it—but good! Operating conditions can be hot, cold or wet . . . this tough, all-purpose grease does its job regardless.

You can see how one multi-purpose grease that does the work of many is a big money-saver. It reduces inventory, cuts lubricating costs and prevents application errors. Check the saving yourself—test Gulfcrown. Ask your Gulf sales engineer or write for free literature.

GULF OIL CORPORATION
1822 Gulf Building
Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

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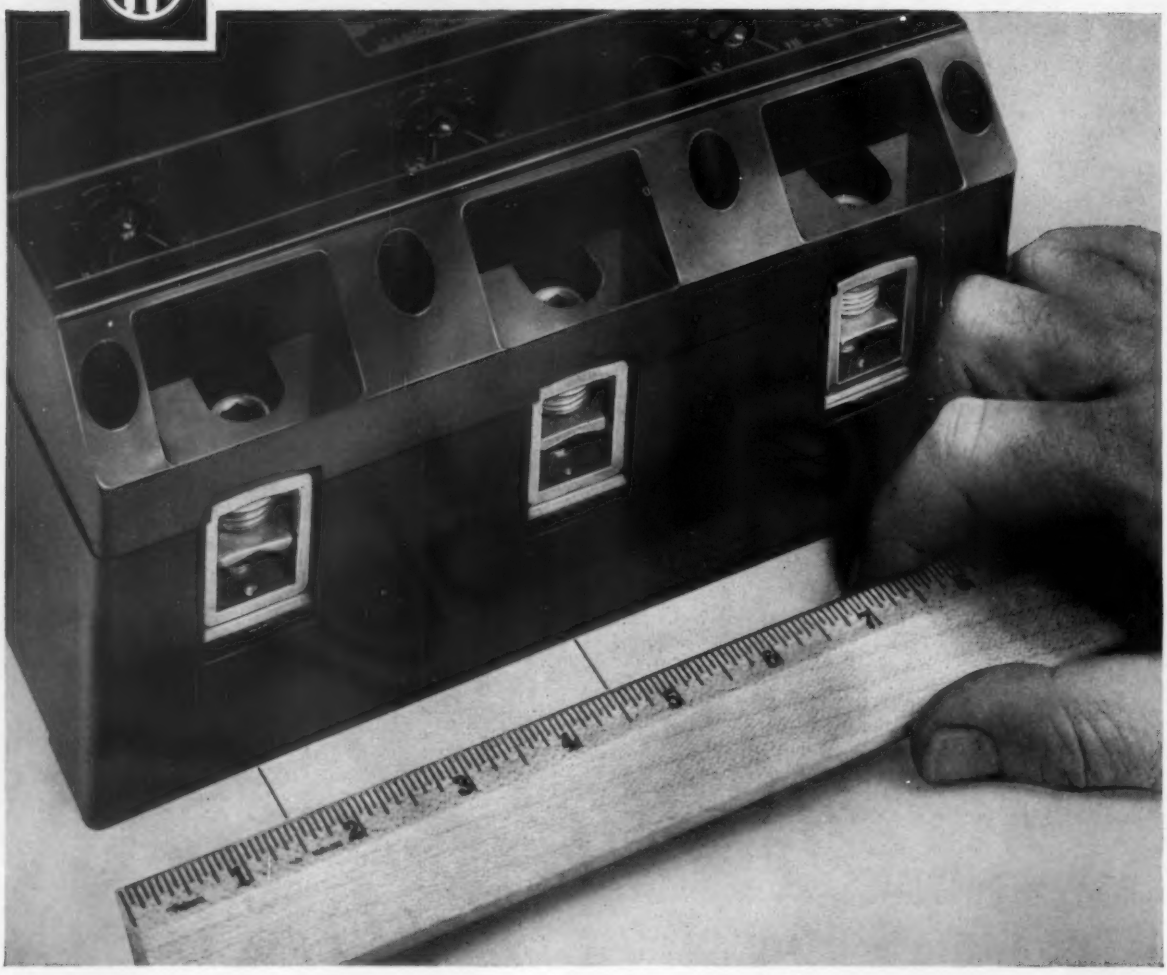
MOLDED CASE CIRCUIT BREAKERS



I-T-E Molded Case Circuit Breakers Have Extra-Wide Pole Spacing

In most circuit breaker applications, the extra-wide pole spacing in I-T-E circuit breakers could be important to you for at least three reasons:

1. Gives added safety
2. Facilitates installation
3. Breaker design permits sturdier construction

Minimum spacing between I-T-E pole centers is 1½ in.—3 in. in all larger breakers. Thus I-T-E molded case circuit breakers give you the maximum in design as well as in performance.

ALL TERMINALS ARE ENCLOSED

An additional design feature of I-T-E molded case circuit breakers is the completely enclosed terminal—no live parts are exposed which can accidentally be touched by the hand.

Wider pole spacing and enclosed terminals are but two built-in advantages which contribute added value to you—at no extra cost. Contact your nearest I-T-E representative for details.

I-T-E CIRCUIT BREAKER COMPANY • **Small Air Circuit Breaker Division**

19th & Hamilton Sts., Philadelphia 30, Pa.

IN CANADA: EASTERN POWER DEVICES, LTD.

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For more facts circle 548 on Reply Card→

Davis Fire Brick Company, Jackson, Ohio

Free Light

How HETRON®-based panels let nature subsidize your lighting costs

Install these polyester panels in skylights and windows and you can flood work areas with free light.

Efficiency experts have proved that this is the sort of cool, soft light that increases worker efficiency.

Non-glaring, shadowless light makes for safer working conditions, too.

Safer should fire occur • HETRON-based panels will *not* contribute to a fire. HETRON is inherently self-extinguishing—will burn only when in direct contact with a hot flame—snuffs out as soon as the flame source is removed. HETRON-based panels are shatterproof, too.

You can get HETRON-based polyester panels with both Underwriters' listing and Factory Mutual approval. For the names of reputable fabricators, write us today.

Safe for any plant that recognizes Underwriters' listing and Factory Mutual approval. HETRON-based panels are fire-retardant, shatterproof. Available in corrugated and flat sheets which are easy to install and require little maintenance.

DUREZ®

DUREZ PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

3906 Walck Road, North Tonawanda, N. Y.

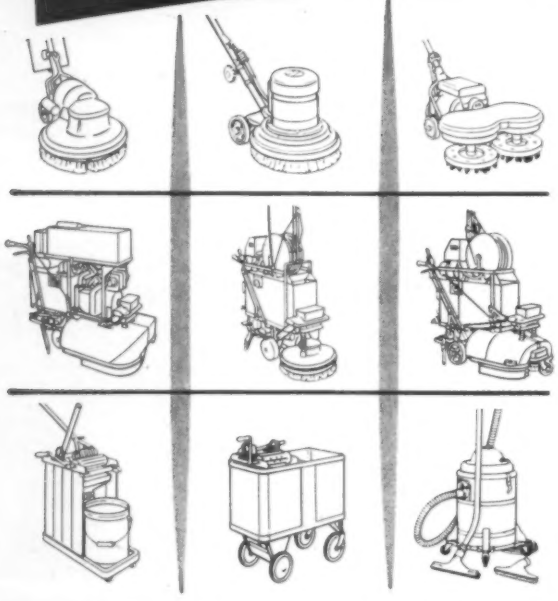
HOOKER CHEMICALS PLASTICS

Keep your floor-maintenance men happy . . .

with *Job-Fitted* EQUIPMENT!

Choose from the COMPLETE *Finnell Line*

More than a score of models and sizes permits selection of the equipment that's exactly right for your job!



However much a maintenance man may want to do a good job, and at the same time show savings in labor costs, he's *stymied* if the machine is too small, or too large, or is otherwise unsuited to the job. Different floors and areas call for different care and equipment. That's why *Finnell makes more than a score of floor-maintenance machines.* From this complete line, it is possible to choose equipment that is correct in size as well as model . . . that provides the maximum brush coverage consistent with the area and arrangement of the floors.

Finnell offers *Conventional Polishing-Scrubbing Machines* in both concentrated and divided-weight types, each in a full range of sizes . . . a *Dry-Scrubber,* with self-sharpening brushes, for cleaning grease-caked floors . . . *Combination Scrubber-Vac Machines* for small, vast, and intermediate operations, including self-powered as well as electric models . . . *Mop Trucks* . . . a *Wet and Dry Vacuum Cleaner,* in baked enamel or stainless steel, with 1½ hp By-Pass Motor. In addition, *Finnell* offers a full line of fast-acting *Cleansers* for machine-scrubbing . . . *Sealers* and *Waxes* of every requisite type . . . *Steel-Wool Pads* and other accessories — *everything for floor care!*

In keeping with the *Finnell* policy of rendering an individualized service, *Finnell maintains a nation-wide staff of floor specialists and engineers. There's a Finnell man near you* to help solve your particular floor-maintenance problems . . . to train your operators in the proper use of *Finnell Job-Fitted Equipment and Supplies* . . . and to make periodic check-ups. For consultation, demonstration, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 5306 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

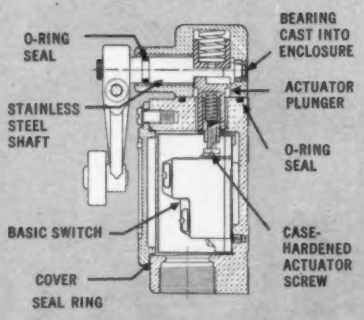
BRANCHES IN ALL PRINCIPAL CITIES

For more facts circle 549 on Reply Card

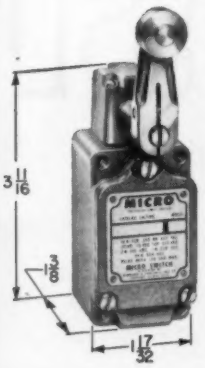
MICRO SWITCH . . . FIRST IN PRECISION SWITCHING

Seals Give Maximum Protection

Sealing is provided by use of O-ring seals on the actuator shaft and between the actuator head and the housing. A synthetic rubber ring seal is provided for the cover. These seals provide maximum protection against the entrance of dust, lint, oil and other liquids.



Moving Parts Completely Sealed

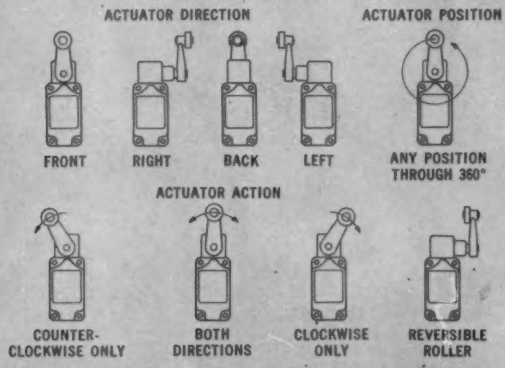


All moving parts and the switching chamber are completely sealed—protected from wear or becoming fouled. Two-circuit double break contact arrangement allows flexibility in circuit design. Roller arm actuators are of forged aluminum alloy—give utmost resistance to shock and vibration.

These MICRO SWITCH "LS" precision limit switches can be your answer to MORE PRODUCTIVE operations

Easy to mount . . . easy to install . . . reliable in operation . . . these small, versatile, two-circuit switches meet today's demand for more automatic processes

Send for Catalog 83 for full information



Field adjustable to any position

The roller arm actuator is field adjustable through 360°, positively locking at any position. Actuators are assembled to operate in either direction or in one direction only, clockwise or counter-clockwise by removing the actuator head and rotating the notched plunger 90°. The head may be rotated to permit actuation from any of four quadrants.

SWITCH CHARACTERISTICS:

Operating force—3 lbs. max.; Pretravel—20° max.; Full overtravel force—6 lbs. max.; Differential travel—12° max.; Release force—½ lb. min.; Overtravel—30° min.

ELECTRICAL RATING: 10 amps. 120, 240, 480 v ac; ½ H.P. 120 v ac; 1 H.P. 240 v ac; .8 amp. 115 v dc; .4 amp. 230 v dc; .1 amp. 550 v dc. Pilot duty rating 600 v ac, max.

Write for the name of the MICRO SWITCH distributor nearest you. Field engineering service is available at your nearby MICRO SWITCH Branch office.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

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300% MORE VISIBILITY

YALE

IN NEW HIGH-CAPACITY GAS TRUCKS

Operator sits high and in center. Upright channels are wide-spaced, nested to reduce frontal obstruction. Right next to them—the hoisting cylinders, one right, one left. Chains that raise carriage are in front of cylinders—*out* of the arc of vision. Carriage has one top bar, one bottom bar—good visibility between them at all levels of fork lift. Result: Yale's exclusive "Wide-Angle Vision" assures safer, faster, more efficient handling of heavy loads.

Premium Engineering Features—Included as Standard—Give Top Performance Under Toughest Conditions:

- I-beam side members in frame for extra strength.
- Channels mounted on ball-bearing rollers to reduce friction and wear.
- All controls conveniently located.
- Power steering and power brakes.
- Yale Fluid Coupling or standard transmission.
- Designed for a complete set of attachments, engineered for minimum loss distance.

CAPACITIES: 15,000 to 20,000 lbs.

GREATER STABILITY...FAST CYCLE OPERATION

New Yale High-Capacity Gas Trucks have low center of gravity, with high underclearance, and a broad lifting base afforded by two ball-mounted lift cylinders. To further increase stability factor, there is wide channel-roller spacing at all points of lift, plus side-thrust rollers on channel and carriage. Large-size, high-flotation tires give good traction. For fast cycle operation, these trucks have lifting speeds up to 60 feet per minute...fast, safe lowering...travel speeds up to 20 MPH...excellent maneuverability.

YALE* *REG. U. S. PAT. OFF.

YALE & TOWNE

INDUSTRIAL LIFT TRUCKS AND HOISTS

GASOLINE, ELECTRIC & LP-GAS INDUSTRIAL LIFT TRUCKS • WORKSAVERS
WAREHOUSERS • HAND TRUCKS • HAND AND ELECTRIC HOISTS

YALE MATERIALS HANDLING DIVISION, A DIVISION OF THE YALE & TOWNE MANUFACTURING CO. MANUFACTURING PLANTS: PHILADELPHIA, PA.; SAN LEANDRO, CALIF.

To meet the need of expanding industries for better materials handling methods and equipment, look to Yale for advances in research, engineering, manufacturing, sales and service—as

YALE BUILDS FOR THE NEW ERA

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The YALE & TOWNE Manufacturing Company
Roosevelt Blvd., Philadelphia 15, Pa., Dept. A-476
Please send the new Yale High-Capacity Gas Truck brochure No. 5230.

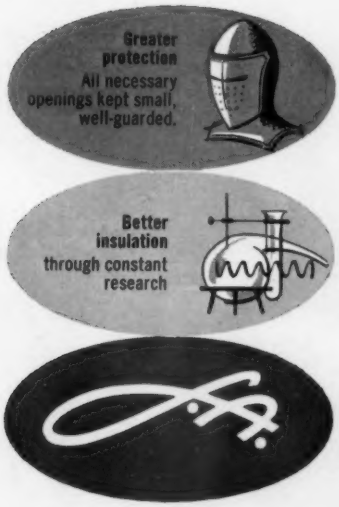
Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

In Canada: write The Yale & Towne Manufacturing Co., St. Catharines, Ontario, Canada



Be glad you weren't working here...

But this sturdy Louis Allis motor was, and still is!

Shortly before this picture was taken, that pulp-mill pump suddenly ruptured. Blasted every object in the area with a thick coating of hot paper pulp.

But note the Louis Allis 20 HP splash-proof motor designed to take this kind of abuse — and come back for more! Note that it took the full force of this blast on its vented *underside* — a motor's most vulnerable point. Only a sturdy, well-designed motor could resist this. Still functioning perfectly this one didn't miss a beat!

Let us tell you more about Louis Allis electric motors. About such unique features as the new varnish of Gilsonite combined with phenolics and alkyds that provides the highest degree of moisture, acid, and alkali resistance . . . locked bearings that reduce end play and extend bearing life . . . the dynamically balanced rotor. And about the many other Louis Allis extras better discussed at length in our file-sized Reference Bulletin 1700. Why not write for it today? The Louis Allis Co., 434 East Stewart Street, Milwaukee 1, Wisconsin.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

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The idea that solved 1000 "headaches"

The famous SBS-60 upside-down hand picture first appeared about a year ago. It dramatically illustrates how SBS-60 Cream Deodorant Soap is almost impossible to waste . . . and why it has solved literally thousands of soap "headaches" in hundreds of nationally known organizations.

What is your soap "headache":

.... soap powder spilled all over your washrooms?
.... bar soap wastefully dissolving on the shower room floor?
.... liquid soap dispensers either dripping or all clogged up?
.... constant work keeping dispensers filled and in order?
.... complaints about your soap from both men and women?
.... whatever your soap "headache", SBS-60 can help.

Write and we'll send complete information that tells you just how SBS-60 Cream Deodorant Soap "cures" most of today's soap "headaches". *Write us today!* We'll rush the details to you.

Write Dept. 57-F3

SBS research developed SBS-60 after years of study. This new type of soap is proclaimed the successor to liquid and bar soaps.

SBS sugar beet products co.

the washword of industry

MAIN PLANT: 302 Waller St., Saginaw, Michigan
Los Angeles, California • Newark, New Jersey
CANADIAN SUBSIDIARY: Chemical By-Products, Ltd., 23 Racine Road, Rexdale, Ontario, Canada

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Now...Local Availability on

Titeflex

Seal-Tight, Time-Saving

Quick-Seal Couplings

Titeflex Couplings are *leakproof* at *all* operating pressures—the higher the pressure the tighter the seal! Couple or uncouple in ONE second... without the aid of tools. Straight-through or single or double check-valve types. Allow free flow of *any* viscous material. Sizes from ¼" to 12" diameter. Made from a variety of metals and alloys to suit innumerable industrial applications.

Titeflex

Flexible Metal Hose

—the ideal "conveying mate" for Titeflex Couplings. Withstands high temperature and pressure stresses. Impervious to vibration and corrosive action.

Both these time-tested products are available for immediate shipment from distributors' stocks in most areas. Otherwise write, wire or telephone direct.

CALL YOUR LOCAL DISTRIBUTOR

Consult the yellow pages of your telephone directory

Your one source for both Hose and Couplings

Titeflex

TITEFLEX, INC., 536 HENDEE STREET, SPRINGFIELD 4, MASS.

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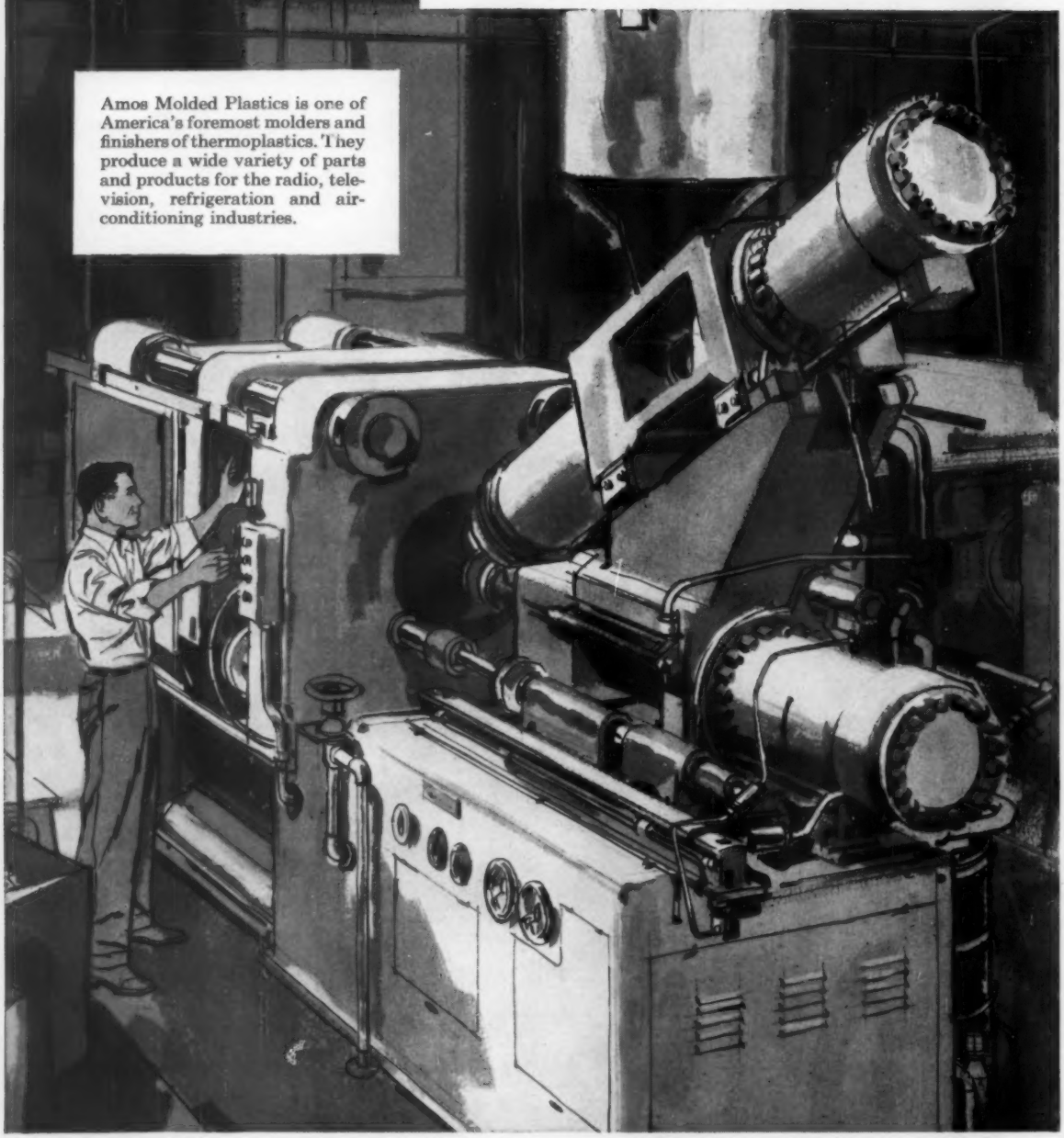
Correct Lubrication in Action...

Hydraulic Pump

Amos Molded Plastics is one of America's foremost molders and finishers of thermoplastics. They produce a wide variety of parts and products for the radio, television, refrigeration and air-conditioning industries.



Mobil **SOCONY MOBIL**

Leader in lubrication for over 91 years

in the **Plastics Industry**

Maintenance Cost Cut 44%

One of many maintenance savings achieved for Amos Molded Plastics with the help of Socony Mobil

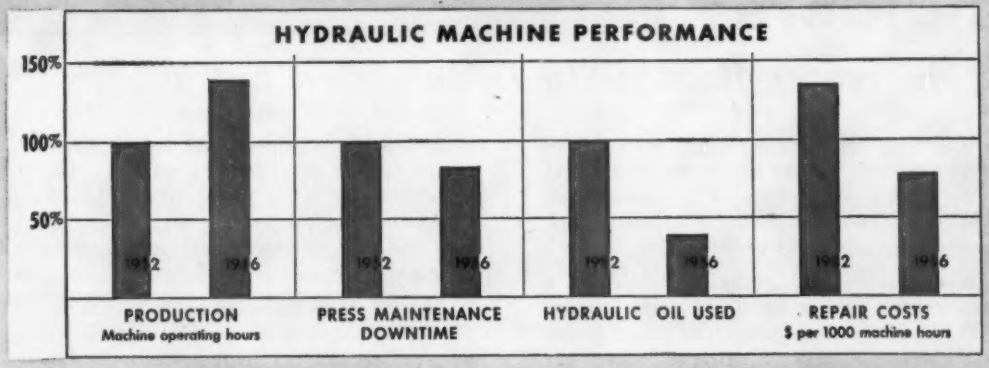
Despite a 37% increase in production hours over a five-year period, Amos Molded Plastics has managed to reduce maintenance and production costs consistently. This leading plastics manufacturer credits Socony Mobil's program of Correct Lubrication with a good share of these savings.

To illustrate: Records show that in 1952 molding machine hydraulic pump repair costs ran $135 per 1000 operating hours. Mobil engineers, working closely with the plant engineer, analyzed maintenance procedures . . . suggested improvements. They helped set up lubrication schedules for each machine . . . recommended the correct Mobil product for all equipment. Today, in spite of higher labor and parts costs, repair expenditures have been cut to $76 per 1000 operating hours . . . a reduction of 44%.

This is Correct Lubrication in Action—the only program that gives you the benefit of 91 years of lubrication knowledge . . . the services of more experienced lubrication engineers . . . top-quality products. It cut costs for Amos Plastics. Why not for you?

How Correct Lubrication Cuts Maintenance Costs

Graph shown here gives an accurate picture of results achieved for Amos Plastics through Mobil Correct Lubrication. Some ways this remarkable record was accomplished are detailed below.



Machine downtime cut — Excessive downtime of molding machines was found to be due to oil leakage and oil contamination. Mobil engineers recommended improved oil seals . . . set up periodic laboratory analyses . . . proposed annual cleaning of hydraulic systems. This cut downtime 17% . . . saved $13,800 over 1952 figures.

Oil consumption cut sharply—Socony Mobil maintenance clinics, conducted for plant's hydraulic engineers, taught them latest methods of reducing leakage. In addition, because Mobil hydraulic oils are of top quality they can be reprocessed and used indefinitely. Result—oil use was reduced 63% . . . $4,600 saved yearly.

These savings and many more helped Amos Molded Plastics increase profits. For information on how Mobil Correct Lubrication can cut costs, improve production, contact your Mobil representative.

Correct Lubrication

A proved program to reduce maintenance costs

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

For more facts circle 555 on Reply Card

3 NEW AIRCO manual Heliweld holders

for greater flexibility in tungsten arc welding

Wider and higher current ranges of these three new Heliweld holders add a new measure of versatility in the welding of thin gauge sheet aluminum, stainless steel, copper base alloys, magnesium and killed steel.

Water-cooled H50 Heliweld holder has a continuous duty rating of 500 amps DC and 350 amps AC. New nozzle and holder design provides efficient gas coverage at reduced gas flow . . . costs less to operate. Stub loss only 1¼". Parts interchangeable with M50 machine holder.

Water-cooled H20 Heliweld holder has a continuous duty rating of 200 amps, AC or DC, yet is only 7¾ inches long; weighs 4 ounces. Compactness of the welding head makes the H20 ideal for welding in tight corners. Parts interchangeable with the H10.

H10A and H10B Heliweld holders, both air-cooled, have continuous duty ratings of 100 amps, AC or DC. The H10B holder is the *only* unit on the market that has a thumb-operated gas valve on the handle for greater gas savings.

For complete information consult your nearest Airco Office or Authorized Airco Dealer.

AT THE FRONTIERS OF welding PROGRESS YOU'LL FIND . . .

AIRCO

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In Canada — Air Reduction Canada Limited

Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** — carbon dioxide — gaseous, liquid, solid ("DRY-ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetate, alcohols, and other synthetic resins.

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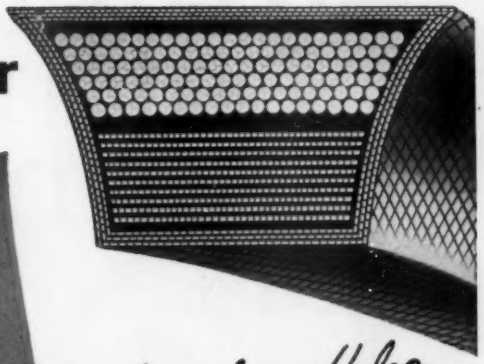
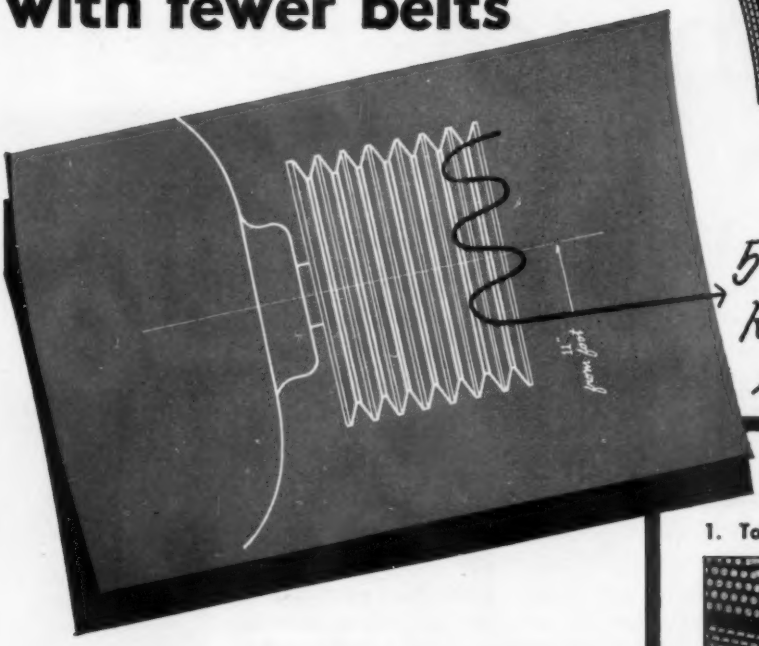
Cut sheave width and weight...

get same horsepower with fewer belts





5 Gates Super Vulco Ropes do the work of 7 standard V-belts

Where space is limited and weight a factor, design your drive with this important fact in mind:

5 Gates Super Vulco Ropes do the work of 7 standard V-belts

That's because a Gates Super Vulco Rope has 40% more horsepower capacity — delivers more horsepower per dollar invested than any standard V-belt drive. Sheaves with fewer grooves cost less . . . weigh less . . . take less room. Drive design is invariably improved.

A wealth of drive data is quickly available to you. Simply call your nearby Gates distributor for a Gates V-belt specialist. Stocks carried in industrial centers around the world.

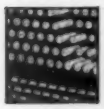
The Gates Rubber Company
Denver, Colorado

GATES Distributors are in the Yellow Pages

The Mark of Gates Specialized Research

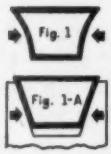
No other V-Belt has ALL these advantages

1. Tough, resilient Tensile Cords



Super strong resilient tensile cords provide 40% greater horsepower capacity . . . easily absorb heavy shock loads . . . reduce number of belts required . . . save weight and space.

2. Concave Sidewalls (U.S. Pat. 1813698)



Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . far longer belt life.

3. Flex-Weave Cover (U.S. Pat. 2519590)

A Gates exclusive: provides greater flexibility with far less stress on fabric. Cover wears longer . . . increases belt life . . . more power available to driven machine.

4. High Electrical Conductivity

Built into Gates Super Vulco Ropes for safer drives (in explosive atmospheres).

5. Oil, Heat, Weather Resistant

Special rubber compounds make Super Vulco Ropes highly resistant to heat, oil, and prolonged exposure to weather.

TPA 248

Gates Super VULCO ROPE Drives

For more facts circle 557 on Reply Card

P&H

electronic crane control

makes other cranes old-fashioned!

You wouldn't equip your plant with "last year's model" equipment, would you? Then why consider an old-fashioned overhead crane?

If you buy a crane today without electronic control, you're installing a machine that's already obsolete!

There's only one way to guard against this obsolescence . . . and that's by buying P&H — the *only* crane equipped with electronic "stepless" control. You'll get improved control response plus reduced maintenance . . . field-tested and proven with P&H thoroughness in over 300 installations.

Advanced engineering and modern design have continually made P&H overhead cranes first choice for all overhead material-handling jobs. As a result, there are about as many P&H cranes in service today as *all other makes combined!*

Check this new development, P&H electronic control, before specifying your next overhead crane. Or, modernize your present AC crane installation (any make) with electronic controls.

Write for "Electronic Crane Control," Dept. 105C, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

For more facts circle 558 on Reply Card

Prepared by B. A. Wasil, Structural Engineer

STRUCTURAL DESIGN OF AN INDUSTRIAL BUILDING
PART II

THE DESIGN OF THE TRUSS for the industrial building described in the last brief will now be discussed.

Loads:

The load that comes from the purlin onto the truss is 185 x 25 = 4.63^k. Estimated weight per panel point of truss and bracings = 5.00^k — (4.63^k & 0.37^k). This panel load is reduced for the first two panel points due to a smaller tributary area. Figure 1 shows the loads and dimensions on the truss. In order to systematize the determination of the forces in the members of the truss a shear and bending moment diagram is shown for the truss. The computations for the forces in the members then follow. See Fig. 1.

It is assumed that the truss can be fabricated and transported to the job in one piece. Thus the lower chord may be made up of a single length of double angles and the top chord of two lengths of double angles. We are to use ¾ in. rivets, thus the minimum leg of the angle that will receive a rivet is preferably to be 3 in. for ½-in. angles or smaller to provide sufficient driving clearance. All members of the truss will be double angles. The outstanding legs of diagonals and verticals may be smaller than 3 in. All angles must be at least ¼ in. thick. Complying with the AISC specifications concerning maximum $\frac{l}{r}$ ratios for both compression and tension members.

Truss Connections:

With the use of ⅜-in. gusset plates the rivet value for a ¾-in. rivet is 13,100 lb. It is thus obvious that at all connections except U_0, L_1, and U_6 only two rivets are necessary in the connection from the gusset to each set of angles. Connection L_2 is shown as typical. See Fig. 2a.

However, the rivet requirement in U_0L_1 is equal to $\frac{35.3}{13.1} = 2.7$ or 3 rivets. And because the top chord is spliced at U_8, the load on the rivets in the top chord at U_6 is not the difference in loads to each side but the sum. Therefore the required number of rivets in the top chords at U_6 is $\frac{59.3}{13.1} = 4.53$ or 5 on each side of U_6. The detail for the connection at U_6 is shown. See Fig. 2b.

The truss will be connected to the columns by a set of double angles.

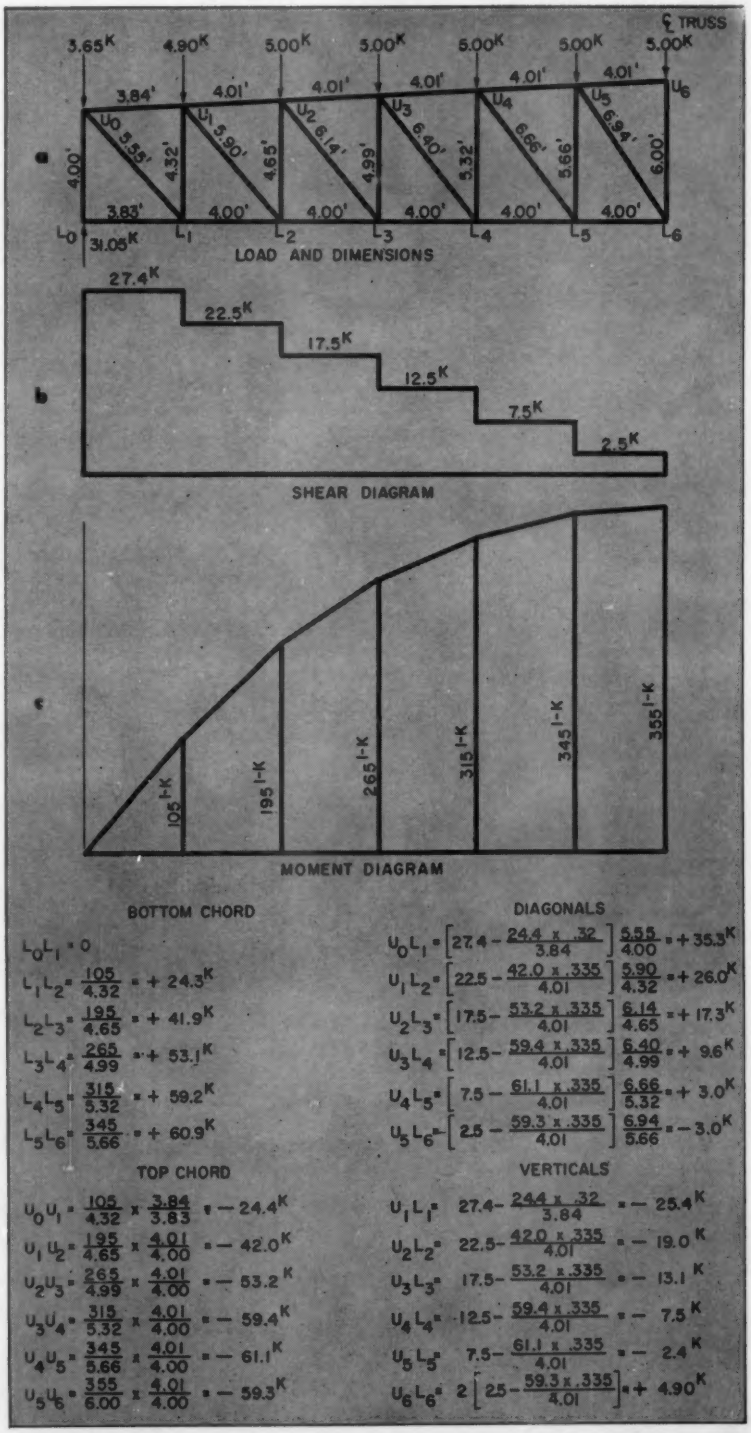


Fig. 1a. This structural diagram represents one half of a truss and shows the external loads at various points. The shear and moment conditions produced by them are reflected by the diagrams above. Computations give forces in members

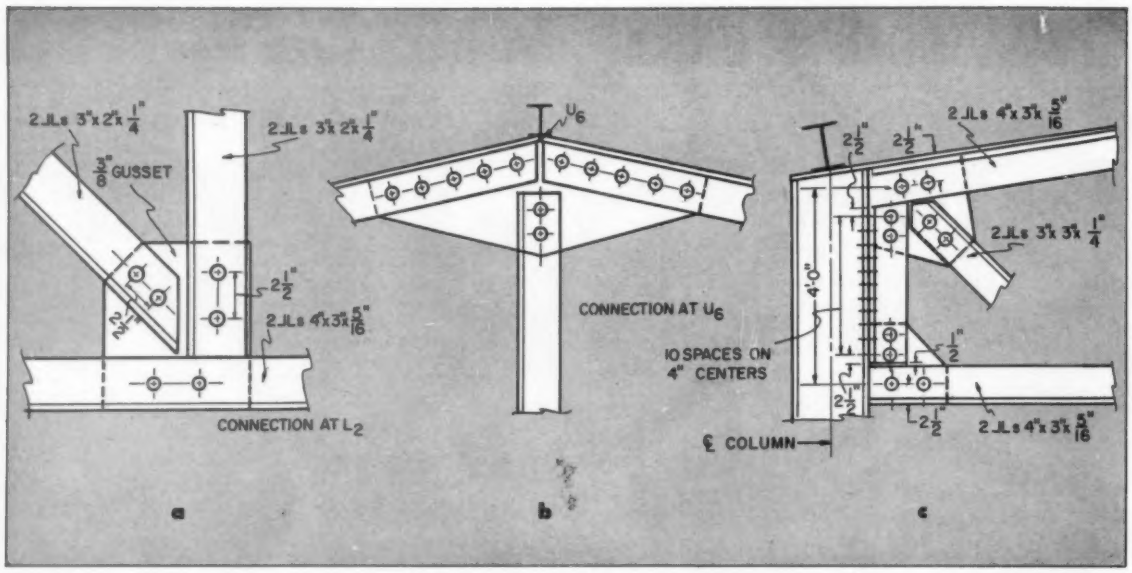


Fig. 2. Left, typical gusset and angle connection. Center, top-middle connection. Right, column-truss joint, rivet spacing

Since the angles will have to be riveted to both gusset and column, two 3 x 3 x ¼ angles will be used. The number of rivets required to connect to the column is given by the reaction divided by the rivet value or $\frac{31.05}{13.1} = 2.4$.

However, maximum spacing is controlled by specification as being 16 times the thickness of the angles or 4 in. Thus the connection to the column is shown above. See Fig. 2c. At a later computation this connection will be checked to determine whether it is adequate to resist moment due to wind.

To check the estimated truss weight, one half the truss has been considered for computation. See Table II.

Although the estimated weight of truss is larger by 144 lb than that of the actual weight, the total load on the truss is changed only by about 2½ per cent. A recomputation will not change the design.

Design of lower chord bracing and struts:

Review the design of these members in the brief, Design of a Trussed Roof, Part II. For the diagonal bracing, the length equals $\sqrt{25^2 + 16^2} = 29.8$ ft. Required r about the horizontal axes = $\frac{29.8 \times 12}{200} = 1.79$ in. Required r about the vertical axes $= \frac{1.79}{2} = 0.90$ in. Therefore use 2 angles 4 x 3 x ¼ in. with short legs back to back and angles set such that the back to back legs are horizontal. Thus r about horizontal axes = 1.92 in.; r about vertical axes = 0.10 in.

For the design of the strut the length = 25 ft. Required r about both axes = $\frac{25.0 \times 12}{200} = 1.5$ in. Therefore use two 5 x 5 x ⅜ angles back to back legs set vertically. Least r = 1.56 in.

Table I. Data includes compression and tension forces, and actual stresses
Table II. Computation for checking estimated weight for one half of truss

Member	Force (kips)	Member* (2 angles)	Gross Area, C Member Net Area, T Member	Actual Stress (psi)	l/r	Allowable Stress (psi)
L_0L_{12}	+60.9	$4\times3\times\frac{5}{16}$	3.09 sq in.	19,700	147.8	20,000
U_0U_6	−61.1	$4\times3\times\frac{5}{16}$	4.18	14,620	37.8	16,310
U_0L_1	+35.3	$3\times2\times\frac{1}{4}$	1.94	18,200	75.0	20,000
U_1L_2	+26.0	$3\times2\times\frac{1}{4}$	1.94	13,400	79.6	20,000
U_2L_3	+17.3	$3\times2\times\frac{1}{4}$	1.94	8,930	82.9	20,000
U_3L_4	+ 9.6	$3\times2\times\frac{1}{4}$	1.94	4,950	86.4	20,000
U_4L_5	+ 3.0	$3\times2\times\frac{1}{4}$	1.94	1,550	90.0	20,000
U_5L_6	− 3.0	$3\times2\times\frac{1}{4}$	2.38	1,260	93.7	12,750
U_1L_1	−25.4	$3\times2\times\frac{1}{4}$	2.38	10,680	58.3	15,350
U_2L_2	−19.0	$3\times2\times\frac{1}{4}$	2.38	7,990	62.8	15,100
U_3L_3	−13.1	$3\times2\times\frac{1}{4}$	2.38	5,510	67.4	14,790
U_4L_4	− 7.5	$3\times2\times\frac{1}{4}$	2.38	3,150	71.8	14,510
U_5L_5	− 2.4	$3\times2\times\frac{1}{4}$	2.38	1,010	76.4	14,160
U_6L_6	+ 4.9	$3\times2\times\frac{1}{4}$	1.94	2,530	81.0	20,000

*Long legs back-to-back in all cases.

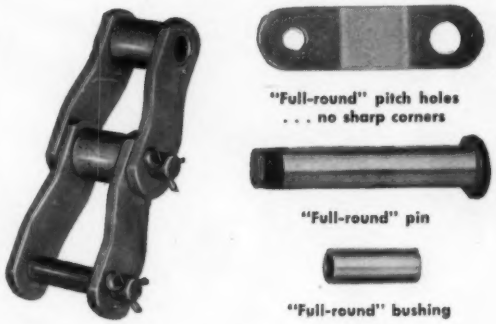
Member	Length × Wt/ft			Member Weights Lb	Member	Length × Wt/ft			Member Weights Lb
U_0U_6	23.89	× 14.4	=	344	L_0L_6	23.83	× 14.4	=	344
U_0L_1	5.55				L_1U_1	4.32			
U_1L_2	5.90				L_2U_2	4.65			
U_2L_3	6.14				L_3U_3	4.99			
U_3L_4	6.40				L_4U_4	5.32			
U_4L_5	6.66				L_5U_5	5.66			
U_5L_6	6.94				$\frac{1}{2}L_6U_6$	3.00			
	37.59	× 8.2	=	308		27.88	× 8.2	=	229

[344 + 344 + 308 + 229] + 123 (10% gusset plus bracing) = 1348 lb.

Interior panel load = $\frac{1348 \times 4 \text{ ft}}{23.83 \text{ ft}}$ = 226 lb — (370 lb estimated value).

"Stress raisers" eliminated by Link-Belt LXS chain design

LXS "FULL-ROUND" DESIGN



"FULL-ROUND" DESIGN eliminates stress concentration points. Heat treatment of all parts adds even greater strength and extra wear life to selected steels. Accurate control of these processes avoids brittleness, poor wear values and low tensile strengths . . . and assures uniformity.

Large pins, bushings mean ample live bearing area for long life

For long life under severe conveyor and drive conditions, Link-Belt LXS chain provides extra strength, increased wear resistance and wider application flexibility. This fabricated steel roller chain incorporates many advanced design and manufacturing refinements, resulting in superior ruggedness and accuracy.

Eliminate weak points

"Full-round" design does away with stress concentration points most frequently subject to failure . . . provides maximum live bearing area between pin, bushing and sidebars. As a result, stress is distributed evenly, increasing chain life.

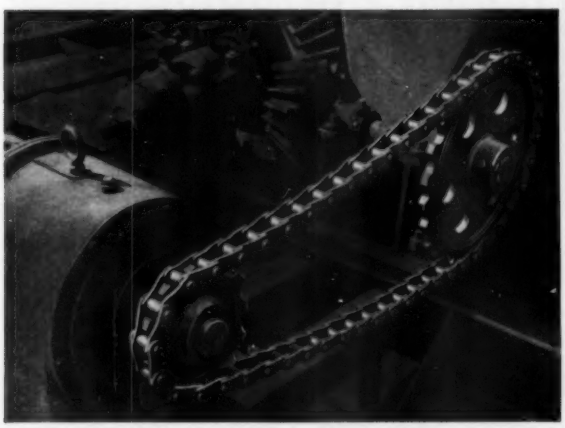
Pins and bushings are accurately sized for controlled press fit, preventing rotation in sidebars. Made from selected bar steel, sidebars are carefully machined for proper pitch hole size and for maintaining firm, tight press fit of pins and bushings. This assures close control of pitch and proper chain length after assembly.

Hardening extends life

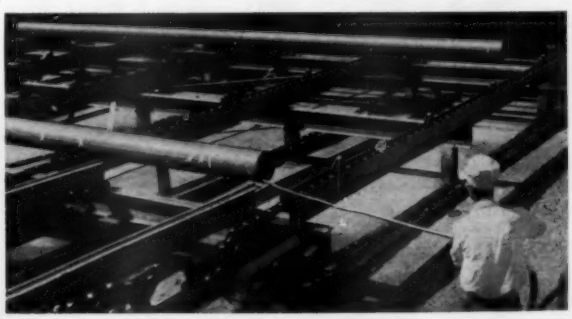
Another Link-Belt long-life extra is the controlled hardening of selected steels used in the manufacture of LXS chain. Pins, for example, are made from a tough steel, specially treated for high strength in shear and for maximum wear value. Bushings are properly hardened to shrug off shock and resist wear.

Rollers are accurately machined to assure proper operating clearances and free-rolling action. Controlled hardening gives them the necessary resiliency and durability.

LXS especially popular for exposed drives, high impacts



Link-Belt LXS chain is the long-life answer for exposed drives, abrasive and high-impact conditions. Its large, live bearing area reduces cutting action of abrasives because load is spread over a broad area.



LXS chain provides extra strength, wear-life for heavy-duty conveying

Link-Belt LXS chain has real stamina—as shown in this conveyor application for handling 1000-pound, 40-foot lengths of steel pipe. Thanks to accuracy of pitch and attachment spacing, plus close matching of multiple strands, LXS has the added strength and wear life for the extra-long conveyors so popular in today's move to mechanization.

HEADQUARTERS for chains, sprockets and other Link-Belt conveying and mechanical power transmission products is your nearby Link-Belt factory branch store or authorized stock-carrying distributor.

LINK-BELT

CHAINS AND SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14.257

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Superduct installation in Neutracel pulping and bleaching building where it is exposed to sulfur dioxide, gas and water vapor.

SUPERDUCT..."an excellent choice as well as the particular corrosive ones

Report by Mr. V. S. Oakes, Electrical Engineer
Hammermill Paper Company, Erie, Pa.

Presented at the AIEE Subcommittee Meeting March 8-9, 1956

In the pulp and paper industry chemical conditions upgrade the importance of expense of installation and frequency of maintenance as factors in selecting electrical conduit. As a result Hammermill Paper Company has conducted tests to determine the conduit that provides the best long-life potential with minimum maintenance and reasonable initial cost.

National Electric Superduct . . . the high quality sherardized steel conduit with a baked on vinyl chloride–acetate copolymer coating was among the types of conduit tested.

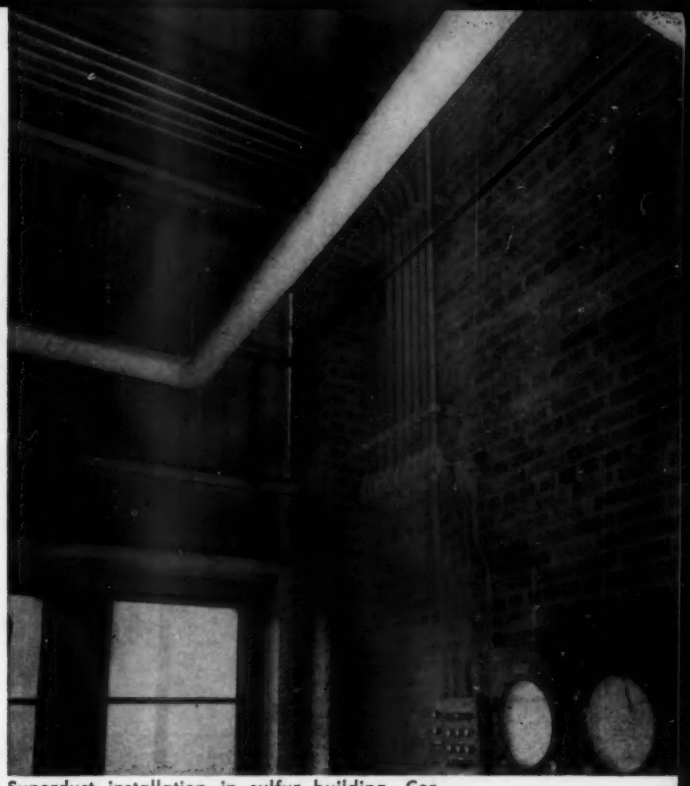
Here are the requirements against which Hammermill measures conduit:

1. Be non-combustible
2. Resist chemical attack
3. Maintain corrosion protective properties during handling, shipping and installation
4. Possess inherent strength (rigid)
5. Be relatively lightweight
6. Possess ductility–easy to bend in smaller sizes
7. Require minimum maintenance – including painting
8. Offer long-life potential
9. Provide a smooth inner surface for "fishing"
10. Provide high dollar value

Performance is established by:

1. Practical testing–involving analysis of various conduit materials mounted on a testboard located in the plant's most corrosive area.
2. Examining conduit performance over a period of time in actual plant installations.

Photographs courtesy of Hammermill Paper Co.



Superduct installation in sulfur building. Corrosive sulfur dust is encountered here. Superduct is also installed in Hammermill's bleach building.

for general purpose conduit applications identified with the pulp and paper industry"

THIS WAS THE HAMMERMILL REPORT ON SUPERDUCT CONDUIT

Favorable Qualities

"Superduct – Combination of sherardizing with enamel coating of vinyl chloride acetate copolymer makes it highly resistant to practically all chemicals.

"Extremely tough and flexible – cost is nominal when compared with zinc-protected conduits – only 29 percent more than black enamel.

"Note: Used at Hammermill–Superduct is considered an excellent choice for general purpose as well as special applications."

®Hammermill Paper Company

THE RESULT–

National Electric Superduct Rigid Steel Conduit has been installed at Hammermill's Neutracel® plant, bleach plant and sulfur melting building.

If you're responsible for the installation and maintenance of a conduit system, you'll find it profitable to investigate National Electric Superduct. Use the coupon to get complete information today.

National Electric Products

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2 Plants • 11 Warehouses • 35 Sales Offices

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Please send me a free copy of your book on Superduct Conduits.

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for every temperature range—
for every operating condition

Carey

SERVICE-PROVED INSULATIONS

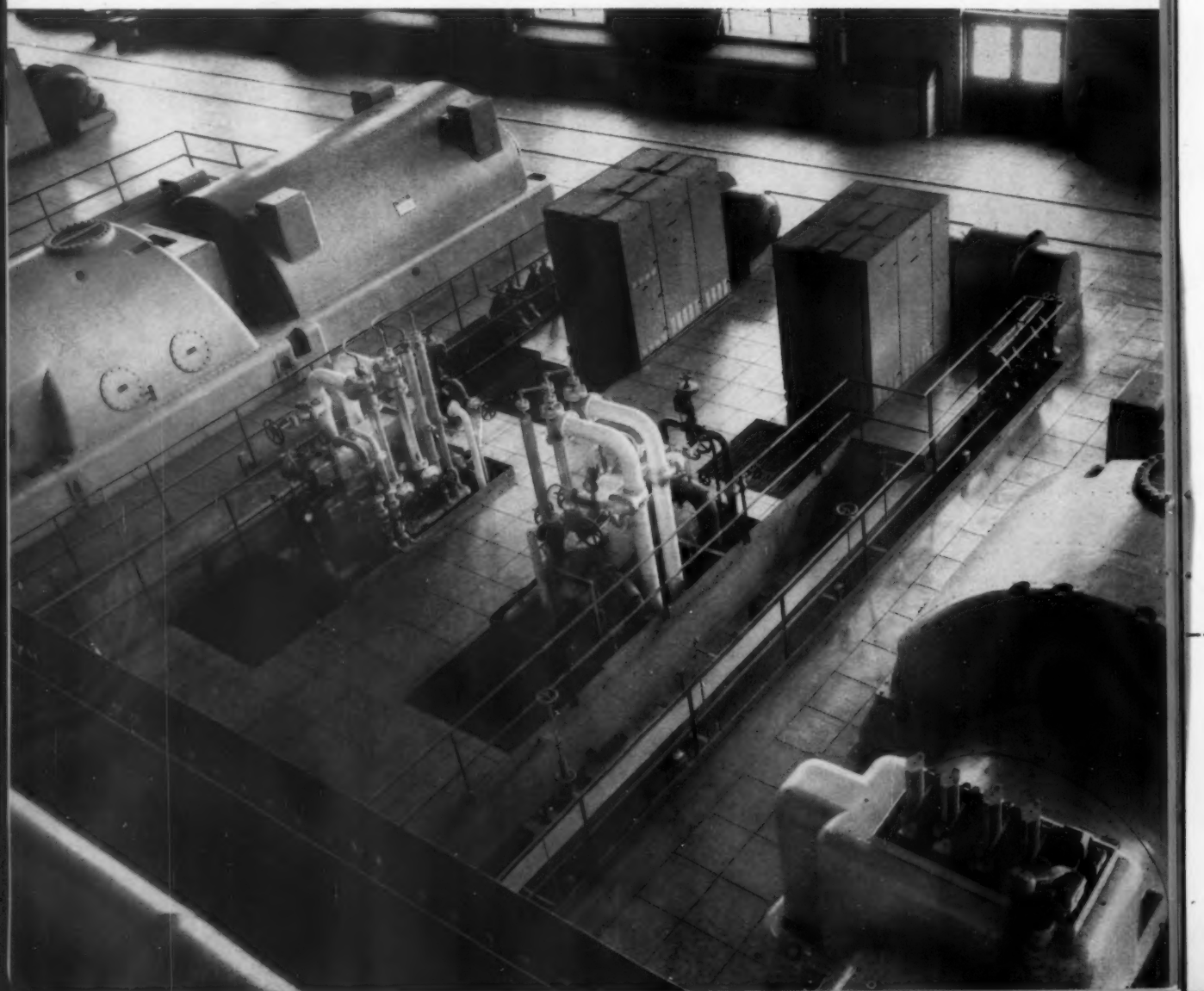
Service Report on Carey Insulations at:

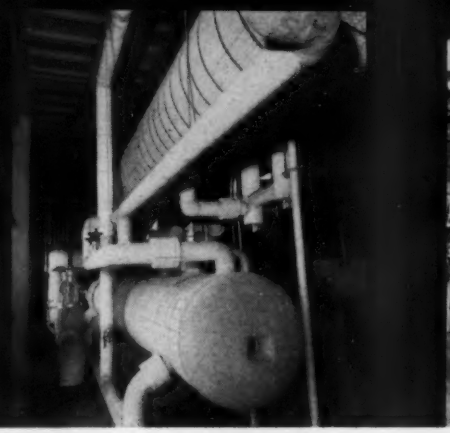
INDIANAPOLIS POWER & LIGHT COMPANY

White River Generating Station, Campbells, Indiana

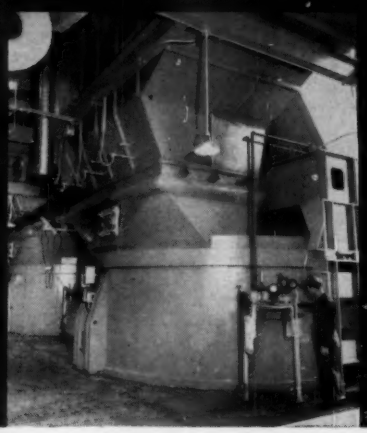
IP&L's White River Generating Station is the largest of the company's five plants. Between them, they supply power throughout 528 square miles of central Indiana. The White River installation alone has a top capability of 376,000 kilowatts and is the main source of power for the sprawling Indianapolis metropolitan area. The last of the plant's six units was completed in October of 1956. Total cost for all units was $51,000,000.

Lower shrinkage, greater moisture resistance make **Carey alltemp**





Carey Alltemp (inner layer) and 85% Magnesia (outer layer) are used on these high pressure heaters and connecting piping. Operating temperatures: 800°-1000°F.



IP&L employee Charles Bass checks pump which propels oil through lubrication system on air-preheater. Carey Alltemp-85% Magnesia combination used on preheater and gas ducts.

and 85% magnesia perform best "under pressure"

White River Generating Station's six boilers are capable of producing over 3 million pounds of steam per hour. Firebox temperatures inside the boilers run as high as 2400°F., and pipe temperatures often exceed 1000°F. This really puts the pressure on Carey Alltemp and 85% Magnesia insulation which cover a large part of the plant's 55 miles of piping. Here are a few of the factors which help these Carey insulation products perform better under the toughest possible operating conditions:

Less Shrinkage — At high temperatures, Carey Alltemp has less than one-half the shrinkage of competitive insulation products. Percentage of heat loss is directly affected by percentage of shrinkage —less heat loss, greater insulating efficiency.

Better Balance — Operating temperatures at White River range from 100° to 1000°F. where Carey Alltemp and 85% Magnesia are used. These products retain their thermal efficiency over this complete temperature range, with only a slight variance in conductivity.

Greater Resistance to moisture, caustics, vibration and shock. Won't shatter or change shape. (Carey Alltemp and 85% Magnesia are easy to cut and fit, too—save application time and costs!)

At IP &L's White River Station, Carey products are meeting a wide variety of heat insulation requirements. They've been on the job since the plant's first unit was constructed in 1948. Repeat orders on subsequent units furnish unmistakable proof of Carey's performance "under pressure".

◀ Auxiliary steam piping at IP&L's White River plant insulated with a combination covering of Carey Alltemp and 85% Magnesia. Operating temperature: 1000°F.

Better Products for Industry Since 1873

THE PHILIP CAREY MFG. COMPANY

Lockland, Cincinnati 15, Ohio

The physical characteristics of Carey insulation products are measured and tested with scientific precision by Mellon Institute of Industrial Research, Pittsburgh, Pa. This is your assurance of the accuracy of Carey product specifications. Mail coupon for literature and sample specifications, or write for the name of your Carey Industrial Sales Engineer.

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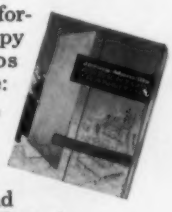

For complete information send for a copy of "J-M Asbestos Transitop." Write: Johns-Manville, Box 111, New York 16, New York. In Canada, write: 565 Lakeshore Road East, Port Credit, Ontario.

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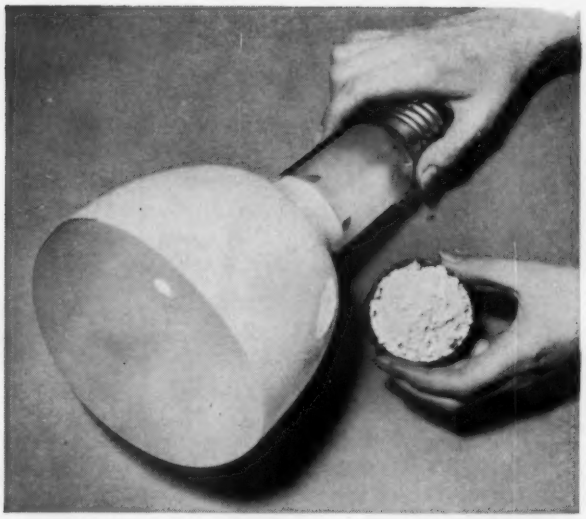

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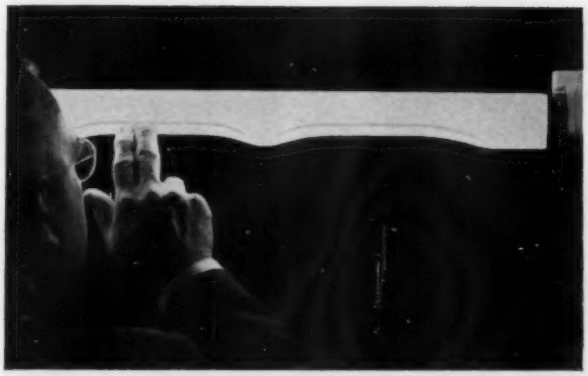

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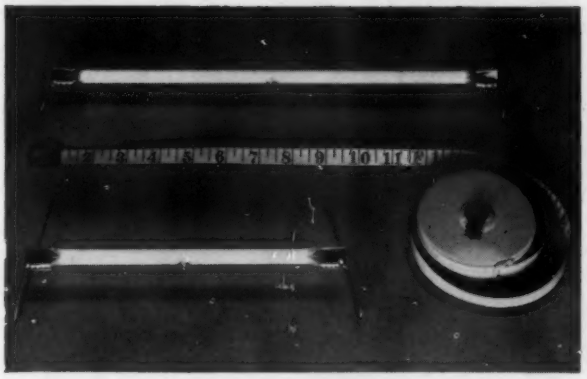

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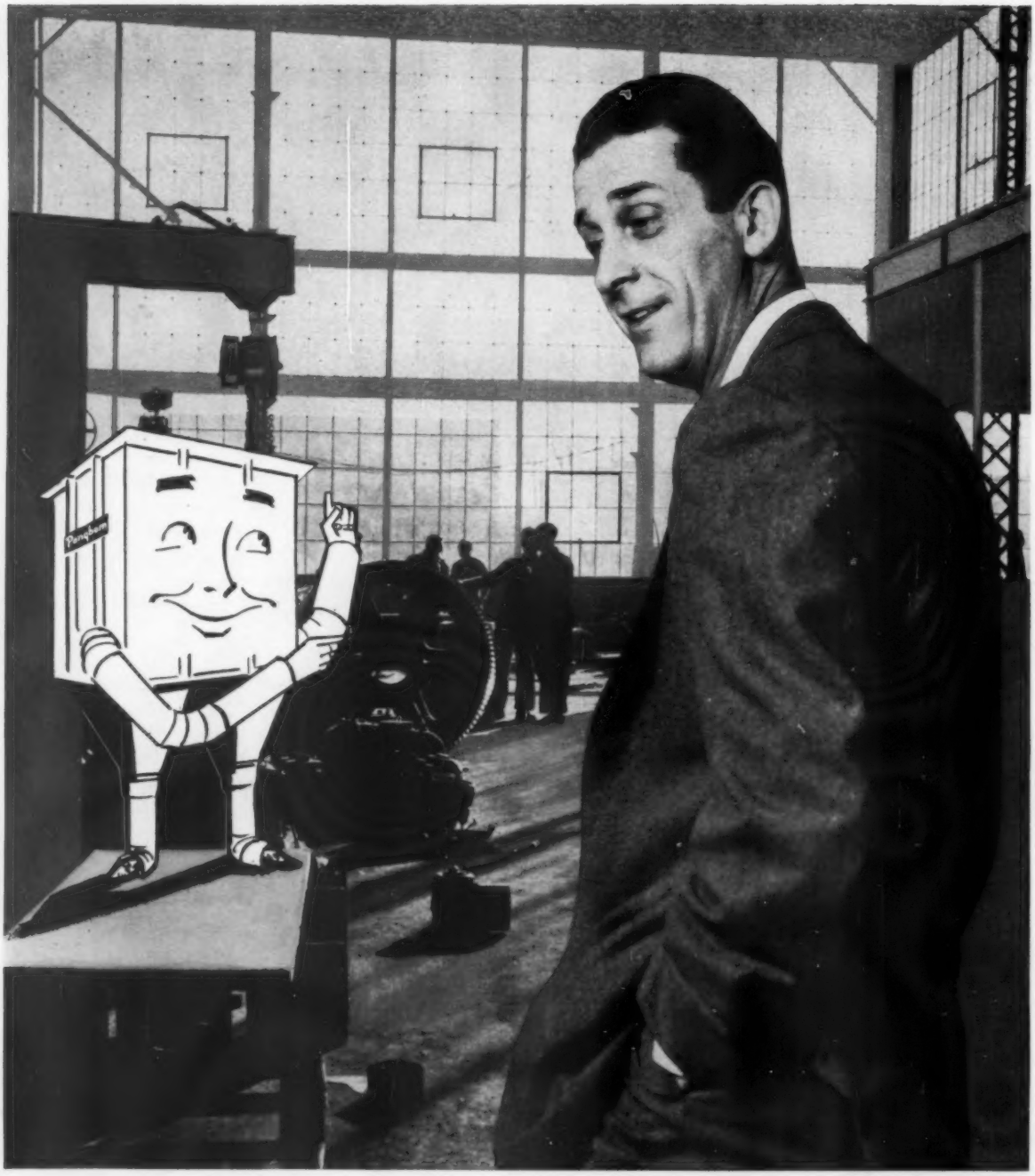

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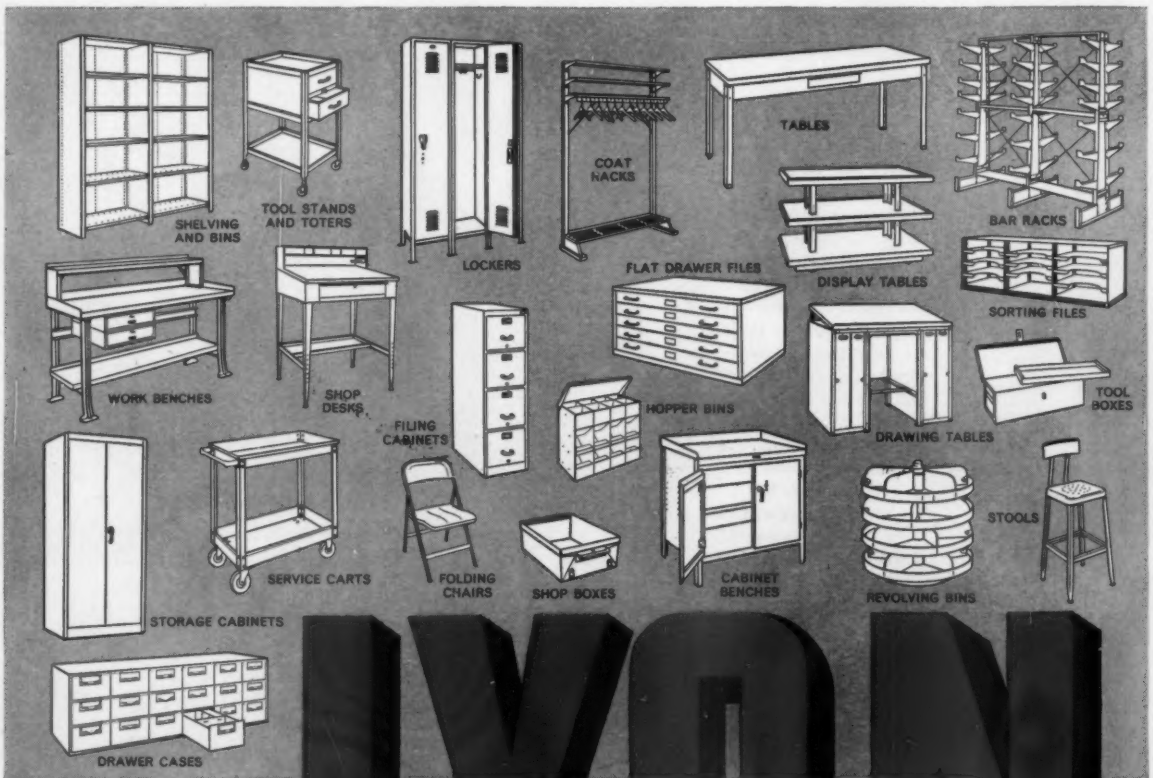

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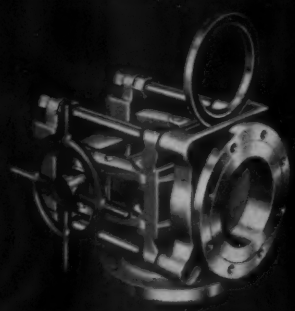

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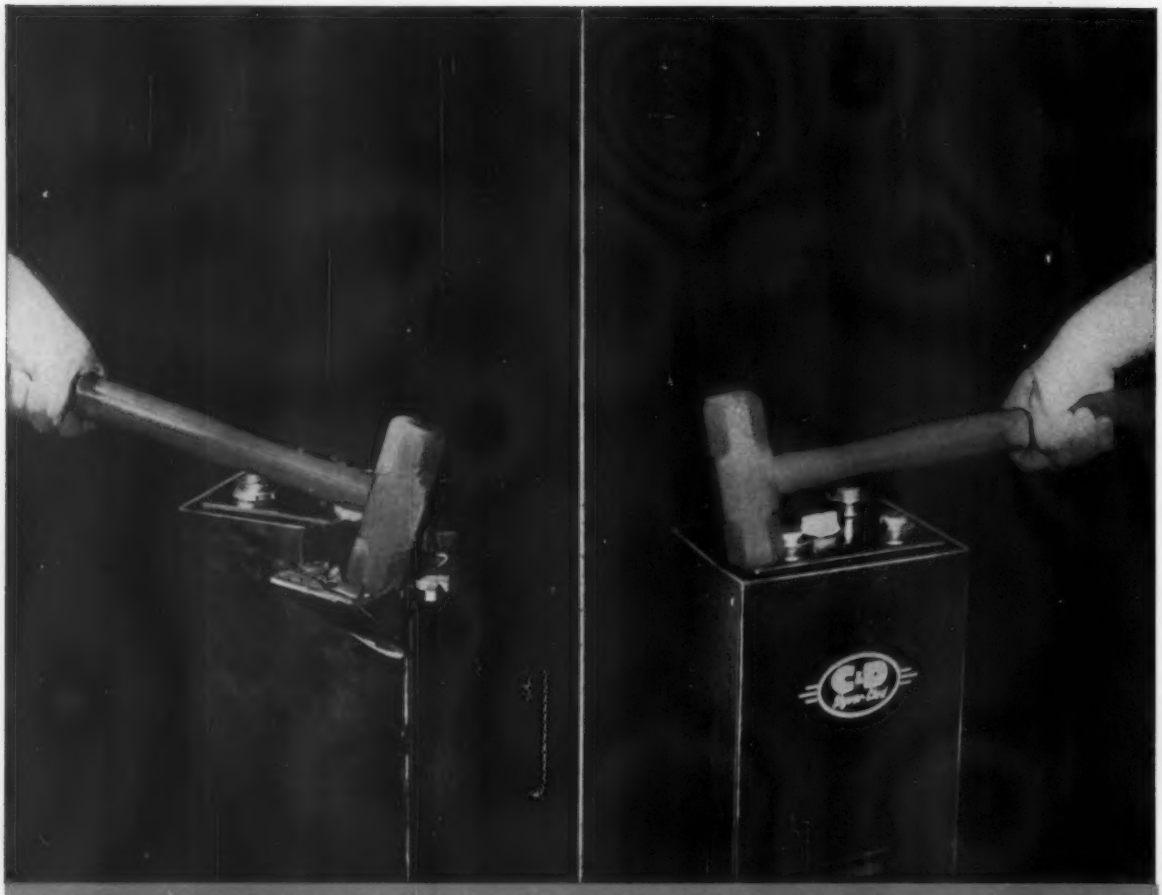

See the difference! The battery cell on the left with a container and cover made of present standard materials has been struck with a four-pound maul. Notice the smashing and cracking. C & D's Slyver-Clad cell, with the container and cover made of new, exclusive C & D *Hi-Impac* compound was struck the same way—without a sign of breakage! Imagine the damage to truck batteries prevented, and the resulting time and money saved on repairs with batteries made of C & D's new *Hi-Impac* material.

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PLANT ENGINEERING
June, 1957

What's Just Ahead in This Issue?

PLASTIC, plastic and more plastic is what you see at Monsanto's new chemical research laboratory. From the ground floor to the roof and from the interior to the exterior, plastic construction materials are being put to the acid test. For more information about the house that plastic built, see page 144.

TIME-SAVER, space-saver—these are two features of the new paint spray system at G. H. Tennant Co. What used to take 80 man-hours to do, now can be performed in 24. Where did they save on floor space? That was easy, they installed the baking oven on the roof. To find out just how this was accomplished, see page 142.

NUMERICAL CONTROL machines are the answer to small lot runs of many production processes. The control tape, prepared in a matter of minutes, is equivalent to an unlimited number of jigs and fixtures. For the complete story on how this control system helps drill 150 holes, at the rate of one hole per second, to an accuracy of 1/64 in., turn to page 96.

CONVERTING THAT older plant for use as a modern production unit? Careful analysis of many factors must be made to insure a satisfactory conversion. What do you do with the existing facilities? Some can be salvaged, others must be replaced. To find out some of the problems confronting the author turn to page 100.

HOW DOES YOUR plant stack-up, electrically, with the thousands of others in this country? Are most of your troubles in the maintenance of equipment? Or do you have more headaches with system design, plant expansion, or with accurate control? We wanted to know how lots of people stood in relation to other people so we asked almost 2000 readers about their "Electrical Problems and Practices." If you want to know how your plant compares with many others read the article starting on page 108.

MAINTENANCE budgets can be tough nuts to crack if you don't have the necessary historical records on which to base them. We asked Clarence Lery, a well-known industrial engineer, to fill us in on how one goes about developing a measuring stick for maintenance budgets. Mr. Lery also tells how to apply the measuring stick in continuous process industries, in repetitive processes and in intermittent processes or "job shop" industries. You'll find this article starting on page 122.

WOULD A VOLTAGE dip in your plant electrical system present a critical large-motor restarting condition because of contactors dropping out too early? How can this be prevented? What about residual voltage effects in the process of restarting? Air break contactors can have response characteristics tailored into their control circuits to provide drop-out control, safe restarting, and reduce operation interruptions. For details see page 132.

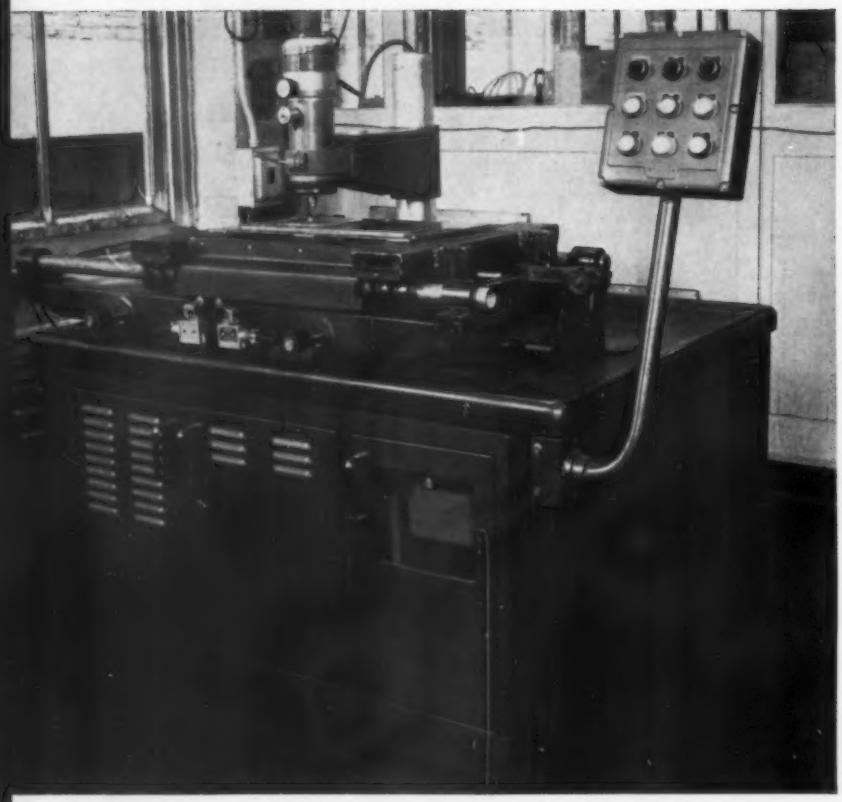


Fig. 1. Drilling machine with numerical control and servo powered work positioning table. Tape reader is shown at lower right behind glass panelled door

Fig. 2. Data converter and tape puncher

By JAMES WOOD, Engineer
Laboratory for Electronics, Inc.,
Boston, Mass.

24,000 Holes In Eight Hours

Punched Tape Control Cuts Hole Drilling

NUMERICAL CONTROL designed and applied to drilling operations enables the machine to accept instructions from holes in a punched paper or plastic tape. Instructions include positioning the work table under the drill head to a particular square on a 1/64 in. grid, select the correct drill in a turret drill head, govern the depth of drilling, control an automatic loading device, or almost anything the imagination can conceive for the machine to do. When an operation is complete, it will accept new commands or cycle to the next operation.

The numerical control consists of two principal elements: the tape preparation mechanism and the drilling machine electronics and servo drive. The tape punch mechanism consists of three components: keyboard, data converter or encoder, and tape puncher, Fig. 2. The drilling machine has four components which are: tape reader, electronic control system, and servo operated work table and drill head.

Tape used is a standard 7/8 in. wide paper or plastic type common to many business machines. The keyboard, similar to an adding machine is arranged in such a way an operator may transfer details from a drawing to the tape.

For example: if a hole is to be drilled 2 and 17/64 by 3 and ½ in. from one corner of the piece, the operator punches the keys marked 2, 17, 64 on the section of the keyboard used for long axis movement of the work table and 3, 1, 2 on the section of the keyboard used for short axis movement of the work table.

Then the operator punches the key denoting a preset selection of operations such as, which drill in the head is to be used and how deep it is to drill. Finally a punch bar similar to a total bar on an adding machine is punched which indicates the end of the particular operation.

While the keys are being depressed the tape is not punched. Instead, the data is stored in the data converter or encoder. When the punch bar is depressed it signals the encoder all data is complete and is then translated into punched holes in a block formation. See Fig. 3.

Holes in segment No. 1 indicate valid information for true operation. The sum of the holes in segment No. 2 determines the inches of travel on the long axis. Fractional inches of travel on the short axis will be the sum of the holes punched in segment No. 3. Long axis fractional inches of travel is indicated by the sum of the holes in segment No. 4.

Sum of the holes punched in segment No. 5 determines inches of travel on the short axis. Machine perform-

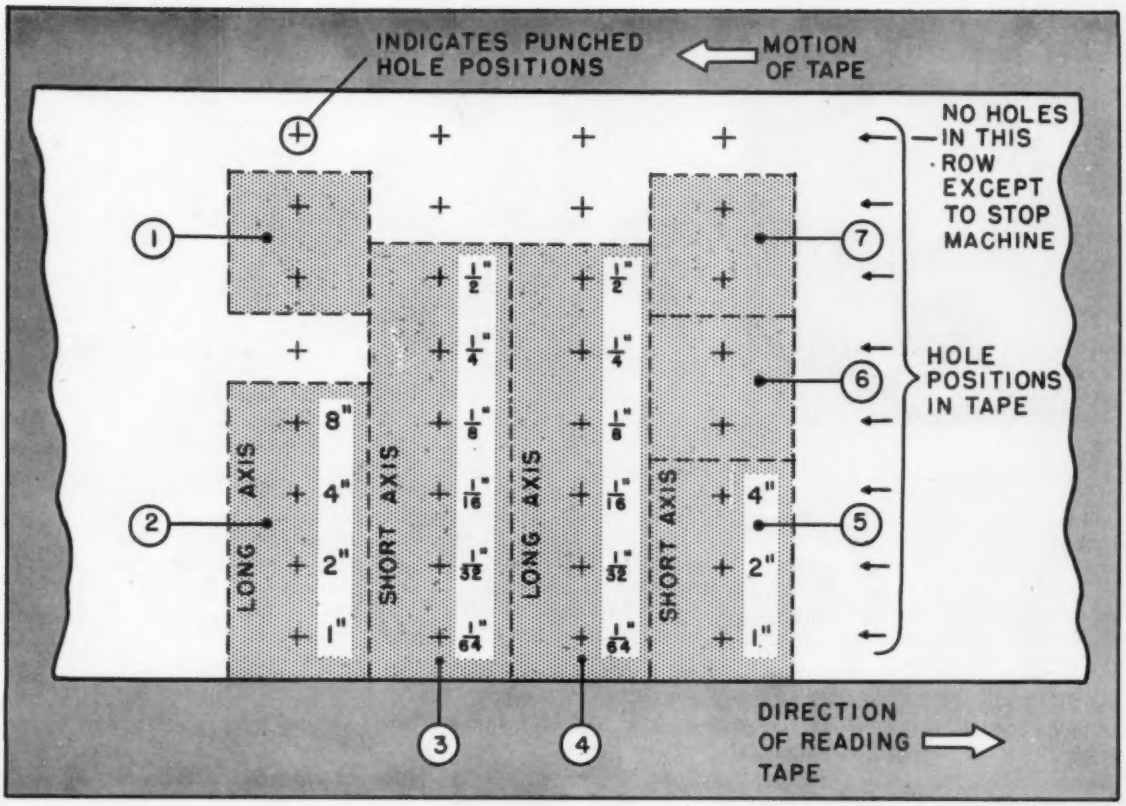


Fig. 3. Block layout for one complete operation. There are eight possible punched hole combinations across the tape and four rows of such combinations per block. Note how each row of holes and segment of each row contains certain data

Costs 90 Per Cent — Here's How

ance is commanded by holes or no holes in segment No. 6. Holes in segment No. 7 indicate that row four is being read, information stored, servos released to position table and ready to start storing new information.

The prepared tape is put in the tape reader, Fig. 5, of the machine. This reader detects the presence and location of the holes with hole detector fingers. The fingers are mechanically connected to switches which when closed transmit this fact electrically to the electronics of the machine.

One example of human engineering incorporated in this machine is the control panel with its arrangement of indicating lights and pushbuttons. The controls on this panel include: power on, power off, start, stop, and hold push buttons plus appropriate lights to indicate its operating status.

After the tape is inserted in the tape reader and the power is turned on, there is a 20 seconds pause before operations begin. This pause is caused by thermal time delay relays inserted in the main circuits to allow for proper tube warm up and assure correct and precise operation. When the thermal relays time-out, the stop light comes on and the start button can be depressed. Now the tape starts to advance through the tape reader.

The first instruction detected by the tape reader is segment No. 1, Fig. 3, which indicates a valid block of information is to be stored in the electronic storage. The flow of material to and through the machine plus its operation is shown in the block diagram, Fig. 4.

When the complete block of data is stored, the sequential control or "traffic cop" starts to operate by directing the various components to do their particular operation in their proper order. The "cop" starts the work table to the correct position and at the same time puts a subtraction unit into operation. While the table is moving, its position is fedback through a feedback system so the actual table position is known at every instant to an accuracy of 1/64 in.

Feedback instrumentation is of a digital nature. It consists primarily of a very accurate, many pole switch which revolves at a speed proportional to the table speed. By noting what position on the switch is open or closed, a code is generated which precisely determines the position of the table.

The storage and feedback information are subtracted in a continuous parallel subtractor. This subtraction is done completely through the use of switching techniques with transistors and diodes.

Advantages of this subtraction method are primarily accuracy and freedom

Meet the Author

James Wood, Engineer, inspects one of the tiny printed circuit boards that has been drilled with the punched tape control. The small size of the boards requires close control of the table position to insure drilling the hole in the center of the metal terminal

from high quality, high tolerance component reliability. The ability to extend the electronics to higher orders of accuracy depends only on the feedback instrumentation and not on the subtraction networks as is the case with analog subtraction.

As the subtraction is done the answer can be considered an error in the position of the table. This error is applied to a digital-to-analog converter which produces a voltage difference equal to the actual error of the machine. This voltage is supplied to the servo amplifiers which, in turn, feed a voltage to the servos which drive the work table.

The operation just described continues until the output voltage from the subtractor reaches zero and remains steady for 40 microseconds.

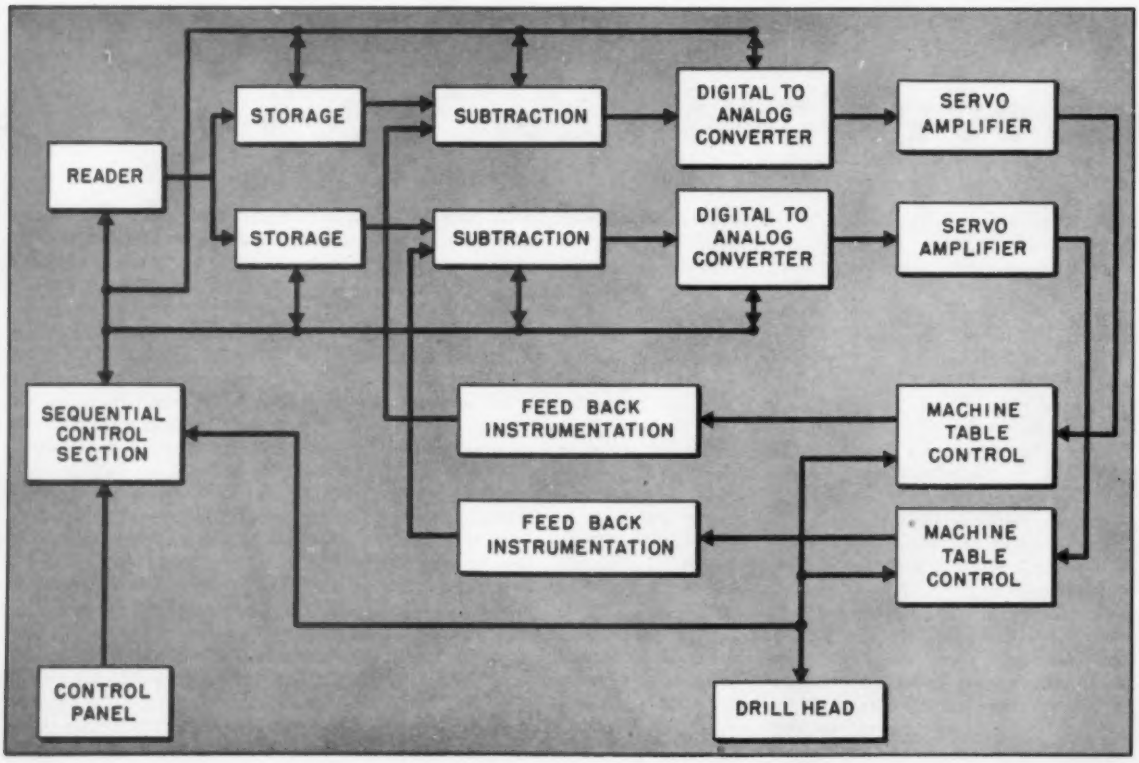
As an analogy, let's say the table has to travel 10/64th from a point A to a point B. Also each 64th of error is equal to one volt. As the table travels towards B the distance it travels is subtracted electronically from the total distance or volts from A to B or 10 volts. When the table has moved 2/64ths from A the error would be eight volts.

This error voltage is fed to the servo amplifiers and then to the servos. As the table approaches B the error voltage decreases. When B is reached, the answer to the subtraction problem is zero and as can be seen, with zero voltage the servos stop and the table is in position for drilling. When this happens the sequential control assumes the table is stopped and in position and indicates that the drill head should come down and drill a hole.

As the drill head starts its downward travel, the sequential section drops the stored data for the hole being drilled and advances the tape reader to store the information for the next drilled hole pattern. When the hole has been drilled and the drill head returns to the up position the table becomes free to move to the next position and the cycle repeats. The entire operation of reading the tape, storing the data, drilling the hole and the like takes only one second.

Time studies were conducted on drilling 150 holes in the printed circuit board shown in Fig. 6. It was necessary to make 1000 of these boards for one of our decade scaler devices. To drill each hole by hand methods cost about five cents per hole or $7.50 per board. To use standard jigging

Fig 4. Block diagram showing flow of instructions from the tape reader to the servo amplifiers controlling the machine table



techniques and drilling, where jigs were made up, and a large quantity required, the price per hole would be two cents or approximately three dollars per board.

Using punch and die techniques, the punch and die set would cost approximately $2000, making the cost about two dollars per board on a 1000 run.

Finally, we made a cost study using numerical control. First it was estimated it would take one day to prepare the tape. Included in this time period was the preparation of the detailed drawing if one were not readily available. If the drawing were available, the tape preparation time would be greatly reduced since only the recording of the dimensions on the tape would be required. We estimate approximately two seconds per dimension for this operation or five minutes to prepare the entire tape.

As previously stated, our numerically controlled drilling machine will drill holes at a rate of one hole per second. Thus it would take about three minutes to produce one complete board and 3000 minutes or approximately 50 hours to produce 1000 boards per machine.

If an operator is required to load the machine in lieu of an automatic loader, he must reload every three minutes. Taking his 50 hours work plus tape preparation and drawing preparation time you have a rounded out figure of about 60 hours. The labor cost would be around $100. Multiply this dollar figure by two for various overhead charges and you get a total of $200. Dividing this figure by a 1000 comes to 20 cents a board. This is a conservative saving of 90 per cent.

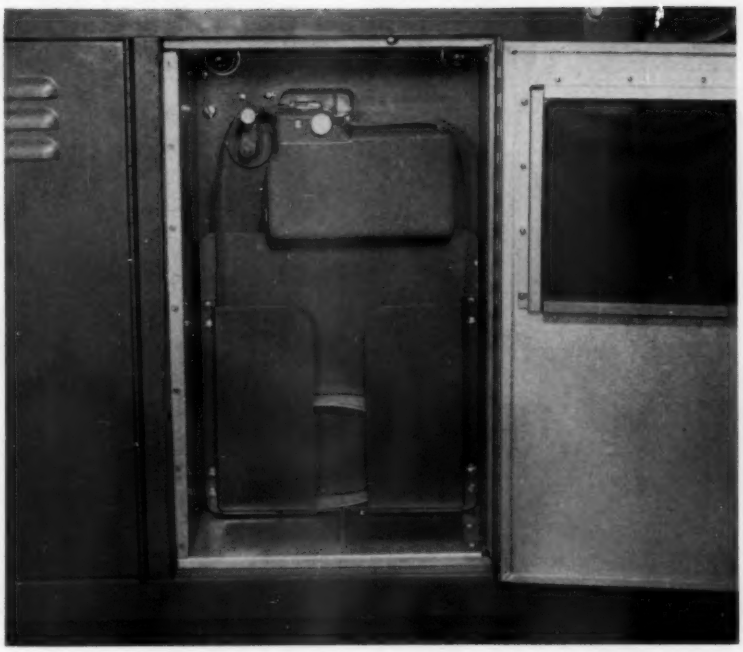
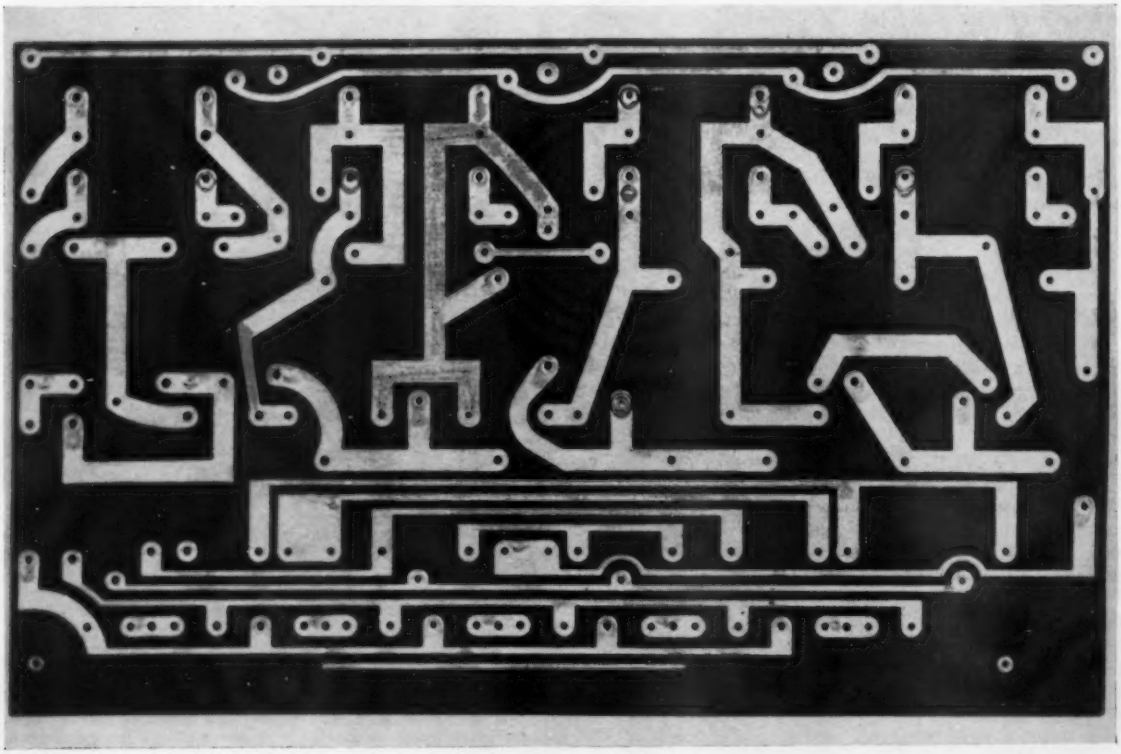


Fig. 5. Tape reader built into base of machine. Holes in tape are sensed by fingers operating switches and transmit information to electronic storage section

Fig. 6. Printed circuit board for decade scaler requiring 150 drilled holes for mounting resistors and capacitors



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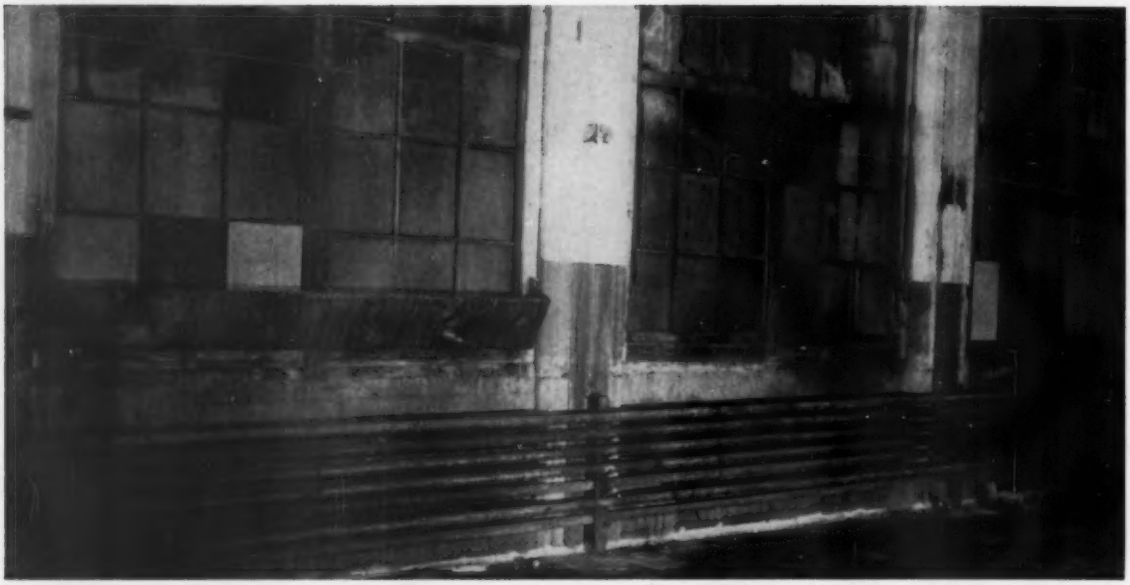


Fig. 1. Warehouse area with high multipane plant windows looks like a poor choice for office area before modernization

Plant Conversion Creates Electrical Problems

After Careful Study Old Plant Comes to Life Again

WHEN IT IS planned to use an old plant to provide modern up-to-date facilities for a smooth flowing production line, considerable engineering and planning must be done to provide the modernization that is expected. Plant buildings under consideration must be surveyed to determine if the plant capacity, for both present and future requirements, is adequate for the products to be manufactured. Considerable review of production processes is required to determine what utilities are required compared to what is presently available in the buildings being considered.

A detailed engineering study must be made to determine the adequacies or inadequacies of the existing power facilities. Depending upon the size of the plant, use of steam and other factors, consideration should be given to the possibility of plant power generation.

The question will immediately come up, "Why not use the existing distribution system and substations, which have been adequate in the past?" To arrive at an answer to this question, in our case, an investigation revealed some interesting facts.

In the plant under consideration there was a 3000 amp, 230 v open wire bus from which the secondary building feeders stem. Every feeder was connected solid to the bus and the first protection appeared at the machine branch circuit. After the master substation switch there was no adequate thermal or short circuit protection. The substations for the buildings that were to be occupied consisted of single phase oil-filled transformers, grouped in banks of three or six, connected to the open wire busses that supplied the three phase 230 v shop power. These old type transformers were basically designed for 20-year service, and use beyond that time results in questionable reliability. The transformers, being oil-filled, are a substantial fire

From Before . . .

Fig. 3. Existing oil filled transformers must be located outdoors away from motor loads unless a vault is constructed

. . . To This

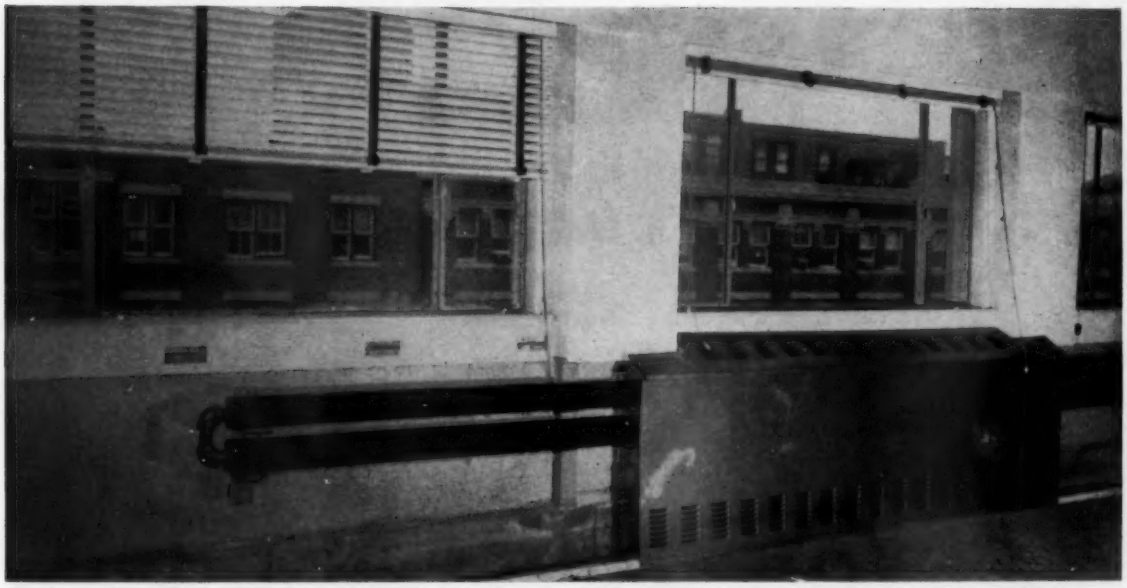


Fig. 2. New picture windows and finned, thermostatically-controlled heating system converts warehouse to modern office

By M. E. JOHNSON, Supervisor of Plant and Construction Engineering
Aircraft Accessory Turbine Dept., General Electric Co., Lynn, Mass.

. . . To After

Fig. 4. Modern transformer substations can be located close to the motor loads eliminating the need for long feeders

hazard and severe restrictions on their use and protection in or adjacent to buildings were placed by insurance representatives.

These existing facilities were adequate for the type of operation that had been going on, but the steady increase in power loads, together with modern distribution requirements and allowances for future expansion, justified a change to new modern equipment.

The first problem to be undertaken should be the selection of system voltages. There are several factors that will govern this selection, the most important of which are load magnitudes, distance power is to be carried, safety codes and standards. Medium and high voltage distribution will depend largely on the utility supply and the appearance of any high voltage motors, furnaces or other equipment in the plant.

After a careful survey, it was decided to eliminate the open wire feeders throughout the plant and install a 460 v Flex-A-Power plug-in bus duct distribution system. The only open wire circuits to remain were the newer circuits to be used as part of the secondary tie system. The insulation on the existing cables was very brittle and new taps on the feeders could not be made without damaging the cable insulation. A higher voltage could not be used on the present cable because of the poor insulaiton.

Realizing that a change to 460 v distribution is a large step, it is well to review some of the advantages of the higher voltage. The cost per kva of all power installations is approximately 35 per cent less at 460 v than at 230 v. For example, a 1000 kva 460 v substation installation costs less than a 750 kva 230 v substation. A typical 1000 kva 13,800 to 480Y/277 v substation now being installed is shown in Fig. 4.

Feeder capacity is doubled for a given wire size when

More "Before"

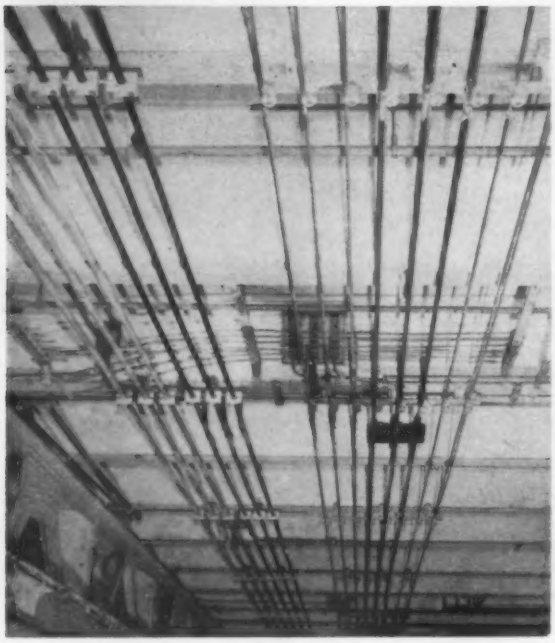


Fig. 5. Existing exposed overhead feeders have poor protection. Aged insulation prevents application of higher voltage

And Another "After"

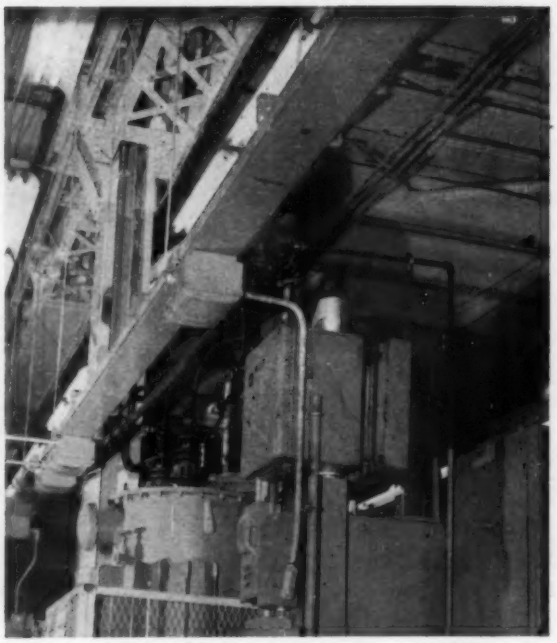


Fig. 6. Modern plug-in duct provides heavy ampere capacity with provisions for making protected taps at any point

reconnected from 230 v to 460 v and with feeders costing between $10.00 and $15.00 per ft, this construction alone could warrant the use of the higher voltage. Standard 460 v substations occupy less total space than would be required for a 230 v substation of equal rating. This is an important factor in a space-conscious plant.

Phase To Neutral Lighting Circuits

Lighting circuits can be handled by means of the 265 v phase to neutral voltage of the substation. Standard fluorescent light fixtures with 265 v ballasts can be purchased, eliminating the use of lighting transformers. The price of copper is increasing steadily, and 460 v distribution would reduce the copper required — thus its share of the cost—for all future installations by one half.

Voltage drop would be reduced to one fourth, for any given load, eliminating the use of extra copper for some circuits. In addition, power losses in the low voltage circuits would be reduced to one fourth of their present value. This is as much as 2 per cent of the annual power bill and might be as high as 5 per cent in some areas. The cost of connecting every future machine would be reduced. The line switch, contactor and wire can all be dropped to half size for any given load.

Our final decision was to lay out a system utilizing totally enclosed 280Y/277 v load center unit substations, armored cable feeders, Flex-A-Power bus duct and 265 v lighting. Although the initial investment is high, the flexibility gained when adding or moving equipment will show a savings over any other type of system.

In a new plant the cost of the lighting system is usually 10 per cent and may run as high as 15 per cent of the cost of the buildings. Since this cost can be considerably higher if you find it necessary to relight an old plant, a very careful appraisal must be made of the existing lighting conditions.

Lighting standards have changed during recent years and you will probably find much of the lighting equipment in an old plant inadequate and beyond the economical stage for use in the new facility.

There are many factors to be weighed in the appraisal of existing lighting installations and these factors will have to be carefully considered before arriving at a decision as to what will be done. Your first impression may be misleading, as the lamps, reflectors, walls, and ceilings may be in poorly maintained condition and the dirt accumulation could be absorbing half of the lamp lumen output.

In many old installations, lighting layouts were made only to plant or office layout and they were not planned for general area illumination. If aisles or desks are moved, a change in the lighting layout must accompany the move. Attention must be also given to the condition, location and flexibility of the main lighting feeders, branch circuits and means of switching. The voltage and regulation of the lighting circuits must not be overlooked.

After all the facts are accumulated and carefully analyzed, a decision must be made on the many questions confronting the plant engineer. Is the lighting system as it exists satisfactory? If not, can some of the existing equipment be economically used in a new layout? Shall consideration be given to higher voltages for lighting circuits? Should the new high-output fluorescent lamps be used where mercury lamps are not used? What can be done to make the new installation as visually comfortable as possible? These are questions the plant engineer must finally answer.

Before old buildings are purchased, let your engineer and his staff evaluate the problems of long range cost in buying and using older plants, to aid in the sound forecasting of value of the property and the expenses involved in their rehabilitation.

Acknowledgment is due Mr. I. G. Block, Electrical Engineer, AAT Dept., General Electric Company for illustrations and other material for this article.

How To Get "Assured" Lubrication—

Lockheed Uses Color Coding, Calendars and Cooperation

By W. C. COOLEY, Maintenance Foreman, Lockheed Aircraft Corp., Missile Systems Division

MUCH HAS BEEN written about the importance of preventive maintenance, and certainly one of the vital ingredients of any preventive maintenance plan is proper and timely lubrication. The foreman, superintendent of maintenance or plant engineer, when required to set up a procedure for lubrication, usually asks himself: "How can I be sure that each piece of machinery is lubricated or serviced with the proper amounts and types of lubricants, and at the proper times?" The answers to this question will give him his servicing, or lubricating procedures. For the purposes of this article, the term "lubrication" includes any other type of servicing required, such as oil changes, coolant changes, etc.

Our key question breaks down into two parts. "First, how will I determine the proper amount and type of lubrication, and how will I be sure that my oilers know the proper amount and type?" This question can be answered by one or all of the following sources. 1. The manufacturers' recommendations. 2. Recommendations of a qualified lubrication engineer. 3. Past experience of your maintenance personnel.

Lubricants Consultant

This division of Lockheed currently purchases the major part of its lubricants from the General Petroleum Corp., which, like many other major companies, furnishes the services of one of its industrial consultants whenever required. Whenever new machinery or equipment is received, the General Petroleum industrial consultant and our maintenance department jointly work out the details as to amounts and types of lubricants, and the change or service interval.

Once the proper amounts and types of lubricants have been determined, this information, together with the service or change interval, is entered on "lubrication record" cards furnished by General Petroleum (called GP lubrication records) Fig. 1, and on Lockheed "lubrication record" cards (called LMSD lubrication records), Fig. 2. On both cards, each part or system is listed with the lubricant to be used and the service period. In the case of the GP lubrication record, the method of application is also listed.

For major pieces of machinery and equipment, the GP lubrication records, Fig. 1, are "plasticized" and cemented to the machine. For smaller machines, lacking the necessary flat surface to fasten the record to, the GP lubrication records, not plasticized, are kept by the oiler in their oiling charts, filed by property tag number. The LMSD lubrication records are kept in the maintenance office, and are filed by

Fig. 1. This is the GP lubrication record card. On it are directions for lubricating the machine chosen by the author to illustrate the lubrication record system at Lockheed—the Cincinnati Hydrotel. Note that lubrication periods on card are divided into daily, weekly, monthly, quarterly and semi-annually. Plasticized copies of this card are cemented to large machines

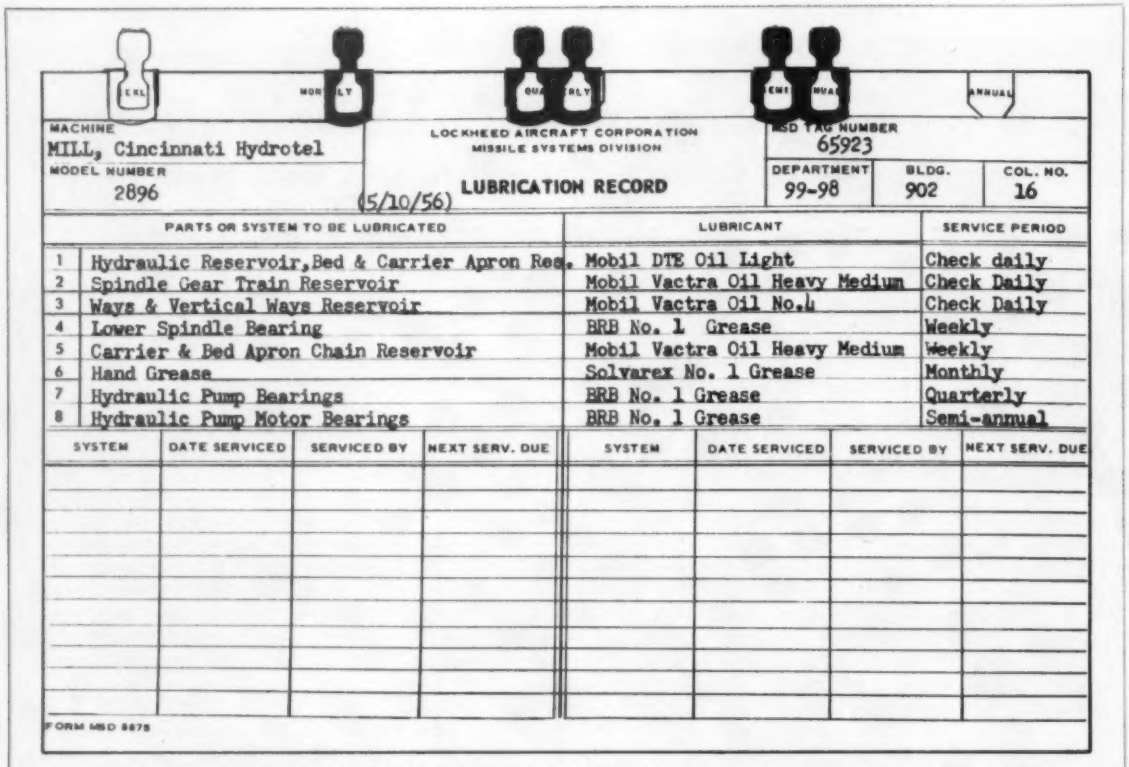
MACHINE Mill, Cincinnati Hydrotel
MODEL NO. 2896
SHOP NO.

LUBRICATION RECORD
(5/10/56)

DEPT. 99-98
Bldg. 902 Col. No. 16
LMSD Tag No. 65923

PARTS TO BE LUBRICATED	LUBRICANT	*METHOD OF APPLICATION	WHEN TO SERVICE	WHEN TO CHANGE
1. Hydraulic Res. Bed & Carrier Apron Res.	Mobil DTE Oil Light	Reservoir	Check Daily	
2. Spindle Gear Train Res.	Mobil Vactra Oil Heavy Medium	Reservoir	Check Daily	
3. Ways & Vertical Ways Res.	Mobil Vactra Oil No. 4	Reservoir	Check Daily	
4. Lower Spindle Brg.	BRB No. 1 Grease	Gun	Weekly	
5. Carrier & Bed Apron Chain Res.	Mobil Vactra Oil Heavy Medium	Reservoir	Weekly	
6. Hand Grease	Solvarex No. 1 Grease	Gun	Monthly	
7. Hydraulic Pump Brg.	BRB No. 1 Grease	Gun	Quarterly	
8. Hydraulic Pump Motor Brgs.	BRB No. 1 Grease	Gun	Semi-Annual	

*ALSO INDICATE CAPACITY WHERE METHOD OF APPLICATION IS BY RESERVOIR.



DAILY | WEEKLY | MONTHLY | QUARTERLY | SEMI-ANNUAL | ANNUAL

MACHINE: MILL, Cincinnati Hydrotel
MODEL NUMBER: 2896

LOCKHEED AIRCRAFT CORPORATION
MISSILE SYSTEMS DIVISION

(5/10/56) LUBRICATION RECORD

MSD TAG NUMBER: 65923
DEPARTMENT: 99-98 | BLDG.: 902 | COL. NO.: 16

	PARTS OR SYSTEM TO BE LUBRICATED	LUBRICANT	SERVICE PERIOD
1	Hydraulic Reservoir, Bed & Carrier Apron Res.	Mobil DTE Oil Light	Check daily
2	Spindle Gear Train Reservoir	Mobil Vactra Oil Heavy Medium	Check Daily
3	Ways & Vertical Ways Reservoir	Mobil Vactra Oil No. 4	Check Daily
4	Lower Spindle Bearing	BRB No. 1 Grease	Weekly
5	Carrier & Bed Apron Chain Reservoir	Mobil Vactra Oil Heavy Medium	Weekly
6	Hand Grease	Solvarex No. 1 Grease	Monthly
7	Hydraulic Pump Bearings	BRB No. 1 Grease	Quarterly
8	Hydraulic Pump Motor Bearings	BRB No. 1 Grease	Semi-annual

SYSTEM	DATE SERVICED	SERVICED BY	NEXT SERV. DUE	SYSTEM	DATE SERVICED	SERVICED BY	NEXT SERV. DUE

FORM MSD 8675

Fig. 2. This is the LMSD (Lockheed Missile Systems Division) lubrication card for the same machine. This card is kept in the maintenance clerk's file. The white tab at far left on the card indicates a daily lubrication chore; next tab to the right, for example, is navy blue and indicates lubrication is also due the second week of the month

property tag number. The function of the LMSD lubrication record will be discussed more fully later on.

The second category of our main question is, "How can the lubrication be scheduled to take place at the proper time?" To further complicate this problem, manufacturers' servicing instructions on machines call for lubrication at a great variety of intervals, from as often as once each hour of use to as infrequently as once every three, or even five years.

The Interval Problem

Let us say that, in a large group of machines, on checking through a manufacturer's recommendations, we find that the following intervals are mentioned: each shift, daily, twice weekly, weekly, semi-monthly, monthly, every two months, quarterly, every four months, semi-annually and annually. This is a total of eleven intervals listed. Any one machine may have lubricating instructions covering any number of these intervals. This gives a total of 2,047 possible combinations of these intervals. In other words, with the eleven intervals listed, you could have 2,047 machines, each with different intervals. This indicates the complexity of interval problem.

First step in reducing this complexity is to reduce the number of service intervals. At this division of Lockheed, the number of intervals has arbitrarily been reduced to six — daily, weekly, monthly, quarterly, semi-annually, and annually.

Naturally, the first question that arises is, "When the manufacturer recommends lubrication, for example, every two months, do you change this recommendation to monthly or quarterly?" The answer to this question involves many factors. First, is the manufacturer's recommendation based on continuous use, or on what? Second, what is the anticipated percentage of use of the machine? Third, what has your experience in the maintenance department shown on similar machines? Fourth, what is the recommendation of your industrial lubrication consultant?

If necessary, one is justified in calling the maker of the machine.

As overlubrication can be, in many cases, just as damaging as underlubrication, care should be taken not to arbitrarily change to the more frequent interval. Very often, after the decision has been made, a period of operating the machine will show the necessity for changing this decision.

An answer to our next question is perhaps the most difficult part of our procedure. "How will I tell my oilers *what* machine requires *which* servicing and *when?*" As mentioned previously, both the LMSD and the GP lubrication records list the part or system to be lubricated, the lubricant, and the service period.

Daily Lube Log

Each week, a daily lubrication log, Fig. 3, is published, listing all machines, by property tag number, that require daily servicing. One is published for each oiler's area. Any machine that requires oiling oftener than daily has an asterisk before it. As more machines are added and/or deleted, and changes in locations made, these are typed directly on the list each week. Periodically, a new list is reproduced, incorporating all the changes. The lists are given to the respective oilers each week, and they initial the log opposite the machine each day indicating they have performed the necessary lubrication.

In addition to the daily lubrication log, there is a periodic lubrication log published each week, listing all machines requiring *other* than daily lubrication. This is shown in Fig. 5.

The maintenance clerk marks on this list, in the column provided, *which* periodic lubrication is required, and if, for example, a quarterly lubrication is checked as due, the oiler in whose area the machine is located, lubricates all parts or systems that require quarterly servicing, as shown on his GP lubrication record.

An immediate question that comes to mind is, "How does the maintenance clerk determine, each week, *which* machine requires *which* lubrication during the coming week?" The clerk determines this by means of colored "signals," or "tabs," on the LMSD lubrication record, Fig. 2. To accomplish this, the year is divided into 12 months of 4 weeks each. Each week in the month is assigned a color. Each month in the quarter is assigned a color. Each month in the half-year is assigned a color. Figure 4 shows this division of the year and the colors.

Thus, each week of the month, each week of each quarter, and each week of each half-year has a particular color combination. (For example, the first week of the first quarter would have a green-green color combination; the first week of the second quarter would have a green-navy blue combination.)

In order to provide us with constant visual evidence of these color combinations we employ two half-year calendar sheets, Fig. 6, with the months of the quarter, and the months of the half-year indicated with the correct colored spot. Bars of the correct color also are drawn over the weeks of the month—green for the first week, navy blue for the second week, etc.

Four weeks of the year are left un-

LOCKHEED AIRCRAFT CORPORATION
MISSILE SYSTEMS DIVISION

DAILY LUBRICATION LOG

DATE: WEEK OF May 13 - 19, 19 57

	PROP. TAG NO.	NAME OF MACHINE	DEPT.	BLDG.	COL.	OILER'S INITIALS MON	TUE	WED	THUR	FRI	SAT	SUN
	3954	Yoder Hammer	99-98	902	6	JR	JR	JR	JR	JR		
	7982	K & T Mill	99-98	902	5	JR	JR	JR	JR	JR		
	8048	Vacuum Pump	76-61	902	23	JR	JR	JR	JR	JR		
*	8084	LeBlond Lathe	99-98	902	11	JR	JR	JR	JR	JR		
*	8085	LeBlond Lathe	99-98	902	10	out for overhaul						
	11791	Covel Grinder	81-16	902	1	JR	JR	JR	JR	JR		
	12899	Cin. Mill #5	99-98	902	5	JR	JR	JR	JR	JR		
	14828	Elgin Mill	76-61	902	22	JR	JR	JR	JR	JR		
*	17822	Racine Saw	99-98	902	7	JR	JR	JR	JR	JR		
	18108	Tree Mill	99-98	902	9	JR	JR	JR	JR	JR		
	19164	Grob Band Saw	99-98	902	9	JR	JR	JR	JR	JR		
	21239	Monarch Lathe	99-98	902	10	JR	JR	JR	JR	JR		
	23642	Pantograph	76-61	902	26	JR	JR	JR	JR	JR		
	42103	Cin. Grinder	81-16	902	1	JR	JR	JR	JR	JR		
	57199	Verson Press	99-98	902	7	JR	JR	JR	JR	JR		
	61016	Hardinge Mill	99-98	902	12	JR	JR	JR	Being repaired			
	65923	Cin. Hydrotel	99-98	902	16	JR	JR	JR	JR	JR		
	78332	Verson Press	99-98	902	14	JR	JR	JR	JR	JR		
	79198	Monarch Lathe	99-98	902	13	Down for parts						
	84244	Monarch Lathe	99-98	902	12	JR	JR	JR	JR	JR		
	89912	Bridgeport Mill	99-98	902	15	JR	JR	JR	JR	JR		
*	91622	LeBlond Lathe	76-61	902	23	JR	JR	JR	JR	JR		
	91625	Thompson Grinder	99-98	902	13	JR	JR	JR	JR	JR		
	96644	Tree Mill	76-61	902	25	JR	JR	JR	JR	JR		

FORM MSD 899-1

John Roe
OILER

Fig. 3. This is a sample of the daily lubrication log. One of these logs is published weekly for each oiler's area. Detailed information is given in the text

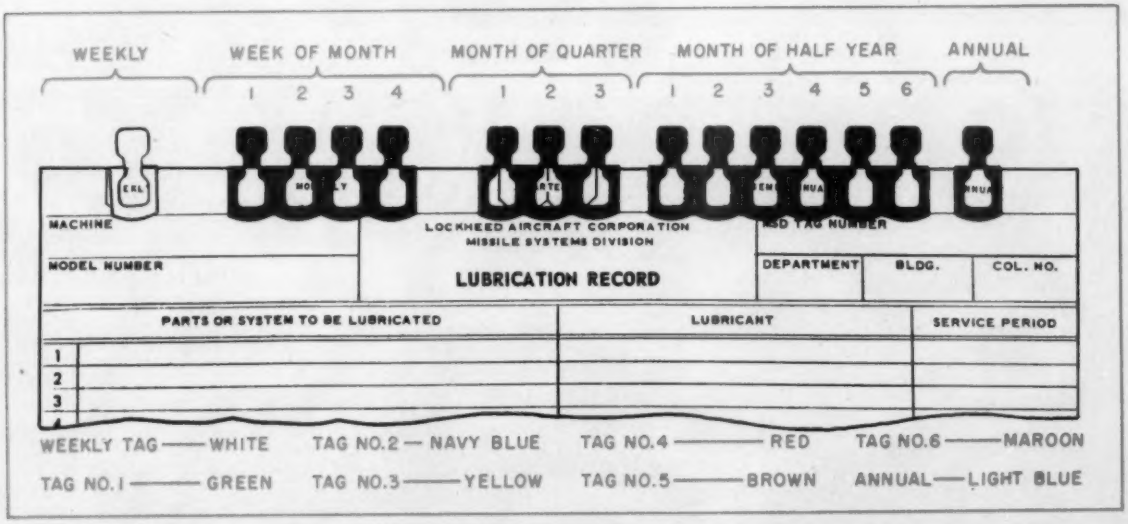


Fig. 4. This is a complete set of tabs on a "demonstration" LMSD lubrication record. They are colored as indicated. Each week in the month is assigned a color. Each month in the quarter is assigned a color. Each month in the half-year is assigned a color. There is, therefore, a color combination for each week of the month, of the quarter, of the half-year

LOCKHEED AIRCRAFT CORPORATION

MISSILE SYSTEMS DIVISION

PERIODIC LUBRICATION LOG

DATE: WEEK OF May 13 - 19 '57

PROP. TAG NO.	NAME OF MACHINE	DEPT.	BLDG.	COL.	SERVICE DUE W	M	Q	S	A	OILER'S INITIALS
57199	Vernon Press	99-98	902	7	✓		✓			JR
57843	Pexto Roll	99-98	902	13						
61016	Hardinge Mill	99-98	902	12	✓					JR
62091	Delta Drill Press	76-61	902	21	✓					JR
63162	Eyeletting Machine	76-61	902	73	-			✓		JR
63778	Pexto Roll	99-98	902	11	✓					JR
65923	Cin. Hydrotel	99-98	902	16	✓	✓	✓	✓		JR
66391	Binks Paint Compressor	81-16	902	2		✓				JR
69822	Geniseo "G" Accelerator	76-61	902	24						
76761	Cin. Mill	99-98	902	15	✓	✓				JR
78332	Vernon Press Brake	99-98	902	14	✓					JR
78543	Pexto Roll	99-98	902	6		✓				JR
79198	Monarch Lathe	99-98	902	13						Down for parts
79244	Oven	76-61	902	26	✓		✓			JR
81783	Oliver Jointer	81-16	902	2	✓					JR
83267	Oliver Planer	81-16	902	2	✓	✓				JR
84244	Monarch Lathe	99-98	902	12						
86754	Delta Drill Press	99-98	902	7	✓				✓	JR
87112	Pullmax Shear	99-98	902	8	✓	✓				JR
89912	Bridgeport Mill	99-98	902	15		✓				JR
89267	Duke Arbor Press	99-98	902	12	✓					JR
91016	Baldor Grinder	81-16	902	1	✓					JR
91622	LeBlond Lathe	76-61	902	23	✓					JR

W - WEEKLY — M - MONTHLY — Q - QUARTERLY — S - SEMI-ANNUAL — A - ANNUAL

FORM MM 667-1

OILER

Fig. 5. This is a sample copy of the periodic lubrication log. It lists all machines requiring other than daily lubrication log. A new log is made available each week

Fig. 2, with a white tab (weekly), a navy blue tab over the monthly space (2nd week), two navy blue tabs over the quarterly spaces (1st tab indicating 2nd week of the month, 2nd tab indicating 2nd month of the quarter), and a navy blue tab and a brown tab over the semi-annual spaces (1st tab indicating 2nd week of the month, 2nd tab indicating 5th month of the half-year). The Hydrotel is now properly tabbed for the service intervals required.

Each week, during the year, the clerk reads the color combinations off her calendar and determines which combination she should look for under monthly, quarterly, and semi-annual to pick out machines that require servicing during the week. The clerk then marks the periodic lubrication logs in the appropriate space and gives them to the oilers. After the logs have been returned to the office, the clerk files the daily lubrication log and posts the periodic lubrication performed on the LMSD lubrication record. The periodic lubrication logs are then filed by date.

We have now answered all parts of our basic question. We now have our procedure set up. We are sure that, as new machines are received, they will be scheduled for lubrication at the

(Continued on page 258)

colored. During these weeks the only lubrication scheduled will be the daily and the weekly. These weeks give the oilers a chance to check their stock of lubricants, clean their equipment or catch up on any work left undone. Two additional colored tabs are used; a white tab indicates that a weekly servicing is due, and a light blue tab indicates that an annual servicing is due. Any annual servicing due is done at the time the machine receives its annual periodic inspection. During the week that the machine comes up for inspection the annual servicing is marked by the clerk on the periodic lubrication log of that week.

Let us take the hypothetical example shown, the Cincinnati Hydrotel, and trace the steps of the maintenance clerk in setting up the LMSD lubrication record for this machine. This machine was received May 10, 1956. The clerk notes that this date is in the second week of the month, the second month of the quarter, and the fifth month of the half-year.

She then notes that this machine, as shown on the GP lubrication record, has daily, weekly, monthly, quarterly, and semi-annual intervals. She first enters the machine on the daily lubrication log, Fig. 3, and the periodic lubrication log, Fig. 4. Next, she tabs the LMSD lubrication record,

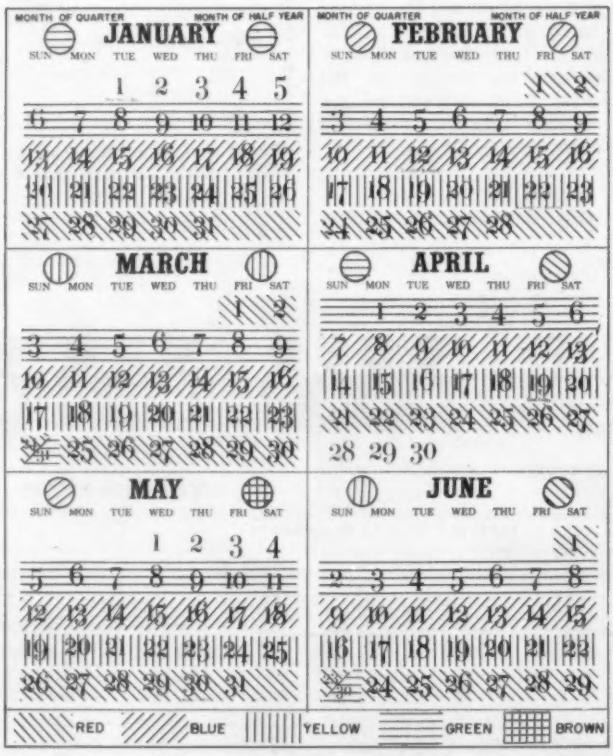


Fig. 6. This is a one-half year calendar sheet. The combination of color spots for the "months of the quarter" and "months of the half-year" with the color strips for the "weeks of the month" make for quick recognition of any week

How Dodge Handles Castings — Safely

MECHANIZATION of many industrial operations, formerly executed by manual labor, sometimes brings with it undreamed-of and undesirable side effects. Dodge Manufacturing Corporation's plant engineering department rediscovered this truth in the process of mechanizing its now-modern foundry. Metallurgists in the company found a problem, previously non-existent, which resulted from pouring a variety of castings from the same iron. Result: it became necessary to anneal some of the smaller castings.

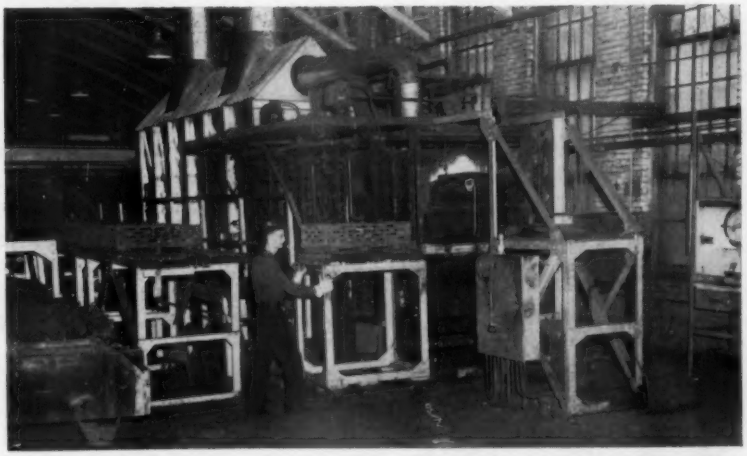
So, the plant engineering department, headed by Paul Jordan, plant engineer, worked out an efficient conveyor system to carry these castings to and from the annealing furnace. At the loading end of the furnace a transfer car is pushed to the furnace door opening where a hydraulic cylinder opens the door, another hydraulic cylinder pushes the basket into the furnace.

At the unloading end, another basket with castings which have completed the annealing trip, rolls out onto another transfer car. This transfer car is then pushed to a powered conveyor which carries the annealed castings—basket and all—to a dumping mechanism.

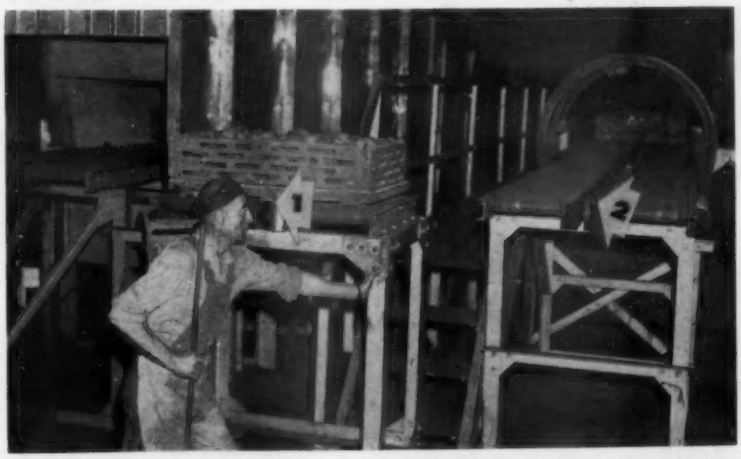
The operation is interlocked and sequenced so that the start button actuates the cycle timer and also opens the annealing furnace door. When the door is fully open a limit switch actuates the pusher. However, three limit switches must be closed before this sequence can be started. Switch 1 is closed when the basket is in position to load the furnace; switch 2 is closed when the transfer car at the discharge end is in position; and switch 3 is closed only when there is no basket on the transfer car.

Other safety measures are tied into the equipment shown in the second and third photos. When the transfer car at the discharge end of the furnace is pushed to the dumping conveyor, the basket cannot be pushed off the transfer car until the center guide wheels on the conveyor line up with the center runner slots on the baskets. Thus, the baskets are kept in line to enter the dumping fixture properly.

Second safety measure is tied into the dumping fixture shown in the bottom photo. Limit switches stop the rollover fixture when it has completed a 360 deg turn. When in the upright position, ready to receive a loaded basket, a magnetic brake holds it in position for loading.



Transfer table at loading end of furnace. Limit switches are in control cubicle



Unloading end shows slots (1) which engage guide wheels (2), keep basket lined up

Limit switches stop rollover fixture. Magnetic brake holds fixture for loading

A Plant Engineering Reader Survey Report

Electrical Problems and Practices

Improved electrical equipment, increased use of direct current, need for closer control of production operations and processes, expansion in facilities, increased costs of maintenance equipment and labor—all of these factors and many more are contributing to the electrical problems in industry . . . Here are some yardsticks of prevalent practices by which you may be able to measure your own plant's equipment, its problems and its practices

By THOMAS E. HANSON, Editor, Plant Engineering

WHAT KINDS OF plant electrical problems are plaguing PLANT ENGINEERING'S readers today? How severe are these problems? What form do they take—modernization, design, expansion, control, or just plain and fancy maintenance problems?

Answers to these and many more questions were sought—and obtained—recently from more than 500 plant engineers out of the total of 1963 who received a questionnaire on plant electrical problems and practices. This was a return of 27.2 per cent. And they do have problems!

Purpose of the survey was, of course, to guide the editorial staff in planning its electrical article coverage for the coming months. Inasmuch as it only supplements regularly-planned field trips of editors it does not, by itself, give us a detailed map of all reader problems but it adequately charts the main routes of these problems. However, in combination with field trips, regular monthly questionnaires on general plant engineering problems, talks with readers all over the country, and a great deal of correspondence, the material has provided us with an excellent guide to electrical ills and has given definite direction to our search for sound, reliable remedies to these ills.

Because misery, they say, loves company, we know all the readers will be interested in learning just what problems their fellow sufferers are faced with. The following summary lists all the findings that can be tabulated. Some of the answers have resulted in long lists which can be tabulated only in the most general way. An example of this is the response to Question 21, "What specific electrical problems would you like to see treated in an industrial publication?" To this question we received more than 217 answers, many of them different, but still permitting tabulation under 41 headings and subheadings.

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1 Question 1. What general types of electrical problems, if any, most urgently need solution in your plant?

THIS QUESTION, like the majority of the questions, required only a check-off of one of six possible choices: 1. Distribution; 2. Control; 3. Capacity; 4. Maintenance; 5. Expansion; and 6. New System Design.

Of these six choices, "Maintenance" led all the rest in popularity (or unpopularity) with a vote of 254 or 27.8 per cent of those respondents checking answers in this category. Next to the leader, but trailing by an appreciable amount, was "Expansion" with an unpopularity vote of 173 for 19 per cent of the total. Comparative votes are shown graphically in Fig. 1.

2 Question 2. Have you ever conducted a power-loss survey in your plant to determine just where electric power was being used uneconomically?

ANSWERS TO this question disclosed that serious thought is being given to such losses or the possibility of such losses. In fact, the "Yes" and "No" answers were practically split down the middle of a total response of 510. There were 238 in the affirmative or 46.7 per cent, with 272 negative votes making up the remaining 53.3 per cent. No replies appeared on 23 of the questionnaires.

3 Question 3. Did your survey disclose, or do you think such a survey if conducted would disclose, sizable losses that could be corrected?

ONLY 412 ANSWERED this particular question. Of this number, 215 or 52.2 per cent answered "Yes," leaving 197 or 47.8 per cent who said "No". There were 121 returns with no reply to this question.

There is one significant fact that emerges upon closer examination of these figures. Of the 238 that indicated, in answer to Question 2, that they had conducted a power-loss survey, 134 or 56.3 per cent said they had discovered sizable losses. Only 10 of the 238 left this question unanswered (which meant that the other 111 blanks came from those respondents who had not conducted such a survey or had also failed to answer Question 2). If we had any wish to editorialize—and it just so happens that we do—we might speculate further that these respondents who felt there were no appreciable power losses in their plants might have one of two things: 1. Such an excellently designed and maintained and modern electrical system that there is no possible doubt regarding its efficiency or; 2. a well-developed ostrich complex.

We are inclined to believe that the former is the case. At any rate, these relationships are shown graphically in the chart, Fig. 2, at the top of the opposite page.

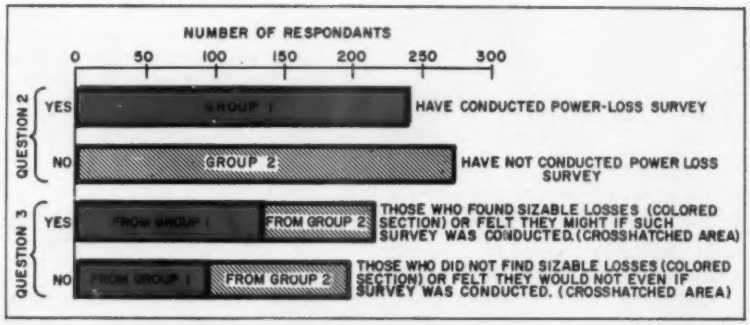


Fig. 2. This is a graphical analysis of the answers to Questions 1 and 2. Colored bar at top shows number of respondents who have conducted power-loss survey in their plants. Crosshatched bar directly beneath it shows those who have not conducted such a survey. Third bar from top indicates number from both of above two charts who either found (colored bar) losses or thought they would (crosshatched) if they did conduct such a survey. Bottom bar shows those who did not find appreciable losses or felt they would not if they conducted a survey

4 Question 4. What is the title of the man directly responsible for specifying electrical equipment for in-plant use?

THIS WAS ONE of the questions requiring a "write-in" answer. Also, it was one of the several questions which was almost impossible to tabulate in any manner. We did, nevertheless, find that 107 different titles were mentioned, among the 444 responses to this question. Of these, 352 were what are generally considered as "plant engineering" titles. They included: Plant Engineer—97; Chief Engineer—43; Electrical Engineer—26; Maintenance Superintendent—14; Maintenance Supervisor—6. So-called "top-management" titles made up the second largest group with 46 titles. Among them were: General Manager—7; President —3; Plant Manager—14; Vice President—4.

Outside firms accounted for 22 of the specifying responsibilities with such titles as Electrical Contractor—5; Consulting Engineer—4; Outside Maintenance Contractor — 1. There were 23 production titles listed. These included: Tool Room Superintendent, Division Process Engineer, Chief Manufacturing Engineer, Production Foreman, etc. Only two purchasing titles appeared.

There were only 9 questionnaires that listed multiple (interdepartmental) specifying influences in purchase of electrical equipment. These 9 questionnaires, quoted *verbatim* stated: "Vice President and Production Foreman"; "No one man responsible"; "Manager and Plant Superintendent"; "Plant Supervisor and Chief Engineer"; "Maintenance Foreman and Production Engineer"; "Self and Consultant"; "Master Mechanic with Electrical Contractor"; "Plant Engineer and Consulting Engineer"; and "Equipment specified after consultation of PA. Boss Mechanic and Electrical Contractor."

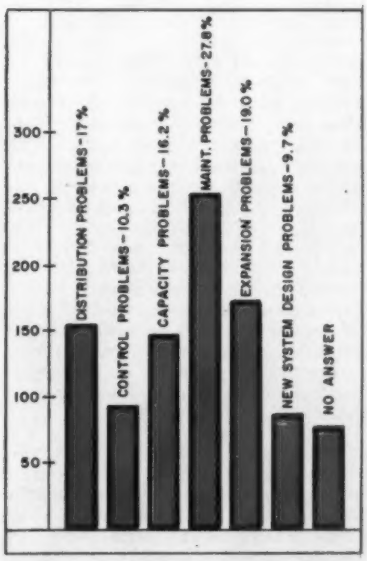


Fig. 1. Graphic comparison shows how problems are divided among the respondents to Plant Engineering's Electrical Problems and Practices Survey. These were answers to Question 1

5 Question 5. What is the title of the man responsible for electrical maintenance and installation?

THIS WAS, OBVIOUSLY, another question requiring a write-in answer. To this question there were supplied 115 different titles among the 454 responses to the question. Of the 454 responses, 420 of the titles were in the plant engineering group. Among them were: Plant Engineer—59; Chief Electrician — 52; Maintenance Foreman—30; Chief Engineer—26, Maintenance Superintendent—24; Electrical Foreman — 19; and Maintenance Supervisor—16.

In addition to the plant engineering titles there were 15 top management titles, 10 outside consultant and contractor titles and 9 production titles.

As with the answers to Question 4, there were but few "divided" or "shared" responsibilities listed.

6 Question 6. Is your plant electrical system grounded?

THERE SEEMED to be but slight difference of opinion regarding the value of grounded vs. ungrounded systems — at least among those who checked answers to Question 6. Out of 515 responses 422 indicated their plant's electrical system was grounded; 93, or 18.1 per cent had ungrounded systems.

7 Question 7. Are you using capacitors, synchronous motors or both for power factor correction?

CAPACITORS GOT a better than 2 to 1 nod over synchronous motors on this portion of the questionnaire. The vote, in favor of capacitors, was 191 (47.6 per cent) to 74 (18.4 per cent). However, there were 136 plants (34.0 per cent) that indicated they used both capacitors and synchronous motors for this purpose. One hundred and thirty-two respondents left this portion of the survey blank.

8 Question 8. Do you feel you have adequate interrupting capacity to handle safely overload conditions in your plant?

THERE WAS A greater area of agreement on this question than on any other in the entire list. Out of a total of 511 responses to this question 458 indicated confidence in the interrupting capacity of their plant's electrical system. This is 89.6 per cent of the total. This left 53 negative answers for a 10.4 per cent segment that had some trepidation on this score.

9 Question 9. Do you use fuses or circuit breakers in branch circuits?

ANSWERS TO THIS question were split down the middle just about as closely as it is possible to get but fuses held a slight edge. Out of a total indicated preference of 657, there were 334 that used fuses (50.8 per cent) while 323 (49.2 per cent) used circuit breakers.

10 Question 10. Do you use power centers in your plant?

ANSWERS TO THIS question indicated that approximately two-thirds of the respondents employed power or load centers. The actual count was 321 with power centers (66.6 per cent) as opposed to 161

without such equipment (33.4 per cent).

11 Question 11. Are your feeders underground?

ONLY 170 OUT of a total listing of 516 indicated complete underground installation of feeders. This was 33 per cent of the total. On the other hand, 287 or 55.6 per cent said "No" to this question. (Fifty-nine said their feeders were "partly" underground.)

12 Question 12. If they are overhead, how are they supported?

OF THE 339 RESPONDENTS who indicated overhead feeder installation the majority of methods listed in the survey were divided among four methods: conduit, racks, poles and towers, and bus duct. The exact tabulation is as follows: Conduit—88; Poles and Towers—78; Bus Duct—33; and Racks—20. Other methods indicated in this portion of the questionnaire—which, of course, called for a write-in—ranged from "brackets" to "supported from overhead beams."

13 Question 13. What type of cable do you use?

THIS PORTION of the survey was answered by 243 of the respondents. Of these, 193 were correctly given as types of cable; 18 used trade names which were not possible of tabulation; 85 answers were too general (example: "nearly all types"); while 12 did not apply (example: "conduit").

Out of the 193 the most-mentioned type was RH (rubber-covered, heat-resistant); next most mentioned with 34, was R (code-grade, rubber-covered; next came TW (thermoplastic moisture-resistant) with 31 mentions. Next, with 18 mentions, came AVL (asbestos and varnish, lead-covered). In all, twelve different types were mentioned.

14 Question 14. Do you convert a-c current to d-c current?

THERE WAS A total of 517 respondents who answered this portion of the survey. Of these, 295 or 57.1 per cent, indicated they did convert. There were 222 (42.9 per cent) who replied in the negative.

15 Question 15. If yes, (to Question 14) what type equipment do you use? Motor generator sets, electronic rectifiers, mechanical rectifiers?

OF THE TOTAL of 438 checked replies, 263 (60.0 per cent) used motor generator sets; 129 (29.5 per cent) employed electronic rectifiers; while 46 (10.5 per cent) used mechanical rectifiers. By comparison with the 295 "Yes" answers to Question 14 it is obvious that 438 checks to the three categories of Question 15 must come from several users of two types of d-c conversion equipment and even a few users of all three types.

16 Question 16. Do you buy primary or secondary current?

THIS QUESTION, it seems probable, may have been confusing to some of the respondents. Perhaps we should have asked if the industrial plant or the utility owned the entrance transformers. There were 319 respondents who stated they bought primary current. This is 66.6 per cent of the total—a figure which is slightly suspect in itself. This left 160 who said they bought secondary current.

To Our Readers—Thanks!

For answering our questionnaires, our sometimes short, but often long, questionnaires, we want to thank each and every one of you. Also, we want you to know that by means of these questionnaires we get a far better picture of your problems and it helps us do an increasingly better job for you in the pages of PLANT ENGINEERING. So, again, thank you!

17 Question 17. At what voltage do you buy your current?

THERE WAS A total of 467 answers to this portion of the questionnaire. Some, of course, bought current at two different voltage ranges. There were 230 respondents that bought current up to 600 volts. From this voltage there was quite a jump to the next group who probably purchased primary current—51 purchased current in the next range from 2160 to 2400 volts; two bought current from 3180 to 3810 volts. There were 54 who purchased it in the range from 4000 to 4900; 21 bought current in the 6300 to 7800 volt group. All of these groupings were arbitrary and were made solely for ease in tabulating.

In the higher voltages there were 21 respondents who purchased current in the 11,000 to 12,800 volt group; 87 purchased it in the 13,000 to 110,000 volt range.

18 Question 18. Do you use wet or dry type transformers?

THE CHOICES given here for check-off were: "Wet," "Dry," or "Both." The greatest number of respondents indicated they used both types. There were 211 (43.8 per cent) in this category. Next largest group were the users of wet-type transformers with 154 mentions or 32.0 per cent of the total. Users of dry-type accounted for 108 check-offs, 22.4 per cent of the total.

19 Question 19. Do you employ single- or three-phase transformers?

MANY OF THE respondents indicated the use of both single-phase and three-phase transformers but this was tabulated only as a vote for each and not under a "both" heading. There was a total of 619 check-offs to the question with 346, or 55 per cent, of the respondents indicating use of three-phase transformers. There were 267 (42.4 per cent) who used single-phase units, while 6 (1 per cent) said they had no transformers.

20 Question 20. If your plant is shut down nights or over the weekend, is someone designated to switch off unnecessary equipment?

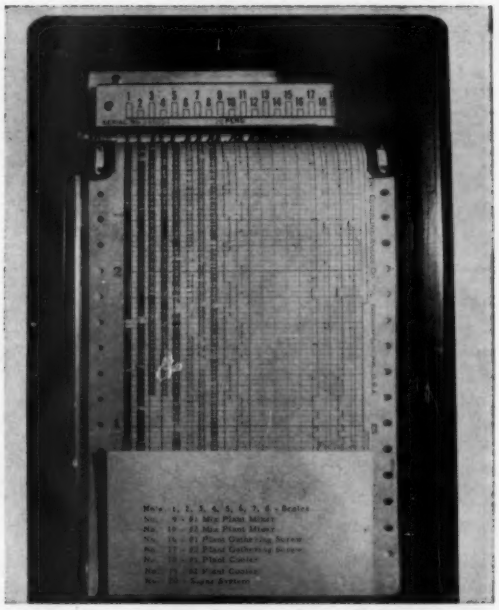
HERE THE respondents were given a choice of checking off "Yes," "No" or "24-hour Operation." There were 356 who answered "Yes" to this question—a percentage of 67. There was a surprisingly large number of plants with 24-hour operation: 146 (27.5 per cent) indicated such an operation. There were only 29 (5.5 per cent) who had no one switching off.

21 Question 21. What specific electrical problems would you like to see treated in an industrial publication?

THIS PARTICULAR question was answered most generously in view of the fact that it required considerable write-in. The requests fell into 30 main categories. The leader insofar as total number of requests was concerned was maintenance—by a wide margin. There were 70 requests for articles on maintenance and these requests, in turn, could be subdivided into 9 different specific categories. The largest grouping in this subheading was for "general maintenance or preventive maintenance articles." Other mentions were for articles on maintenance of specific pieces of equipment such as motors, transformers, electronic equipment. Seven requests were made for detailed information on training and setting up a maintenance department.

Second largest main heading was for distribution system information. There was a total of 54 requests in this grouping which, in turn, could be divided into four subheads. These were: Design—21; Installation—13; Modernization—17; and Costs—3.

Third in popularity was information on controls. There were 33 requests for articles in this classification and there were several very specific and specialized subjects mentioned.



This 20-pen recorder registers the running and non-running time of the scales, mixing machines, sugar system, etc. Information showed what areas were slowing down operations

Needed: running record of downtime and a detailed reason for this lost time . . . Found: recording device which keeps a constant check on equipment . . . Information helps company locate trouble spots and correct them before a major equipment shutdown occurs

Downtime Auditing—

Recorder Pen-Points Troubles Before They Become Serious

By W. B. DRESS, Manager, Manufacturing and Engineering, Igleheart Brothers, Evansville, Indiana

WILL AN ACCURATE log of downtime lead to production increases? That's the question we asked ourselves last year. At the end of a six-month program instituted in our Shortening Mix Department, the answer was a resounding "yes."

Before the new program was started, downtime in the Shortening Mix Department was estimated by line supervision, accounted for, and noted in a delay report. Late last year, however, it became evident that more accurate downtime records were necessary. It was important to have a running record of downtime, accompanied by detailed reasons for the lost time, to locate trouble spots that called for corrective action.

To obtain an accurate accounting of downtime encountered in the department's daily operations, an operation recorder was installed. A 20-pen apparatus was used which logged in two-minute increments both the running and non-running times of the key machines to which it was connected. The recorder was located in the office, rather than in the machine area.

Once the supervisors became accustomed to using the recorder, they made it a habit to check frequently during each shift and log the downtime and its causes. These delay records were accumulated and a monthly downtime audit was issued by Specialty Products Superintendent R. P. Nace. In this report, Mr. Nace charged all downtime to one of nine major causes: Department meetings, out of mix, chokes in equipment, equipment cleanout, mechanical repairs, electrical repairs, machine adjustment, faulty packaging material, and miscellaneous operational.

What Caused the Delay?

Each of these major delay causes was further broken down to find whether the downtime occurred in Shortening Mix Packaging or whether it was caused by lost time in the Shortening Mix Processing area.

For example, if time were lost because of an "out of mix" condition in the Packaging area, the delay might be traced to a sifter drive break in Processing.

As the monthly reports were made, we began to pinpoint machines or areas where delays occurred frequently and took action to correct these situations. A better preventive maintenance program and a more thorough lubrication program were instituted, for instance, to minimize the delays previously caused by frequent frozen bearings.

Equipment cleanout was found to be another major cause of delay. Some 12 or 13 per cent of scheduled production time was lost while systems were cleaned out in preparation for flavor changes.

Cleanout lost time was drastically cut when all sweepers or cleanup people were eliminated from the departments. We created a separate department which performed cleanup work and cleanout for flavor changes on a shift when the plant was not producing.

Chokes in equipment were also studied on the monthly downtime audits. Although chokes were expected to increase considerably in warm weather, the audit showed excessive downtime caused by chokes in equipment during February. The record indicated the majority of chokes were occurring in the high speed unit during production of the white cake mix. Minor alterations were made to the unit which, although not eliminating chokes when the white cake mix was produced, did minimize them.

The first six months of Igleheart's downtime auditing program resulted in a 17 per cent increase in production per scheduled hour and a substantial direct labor savings.

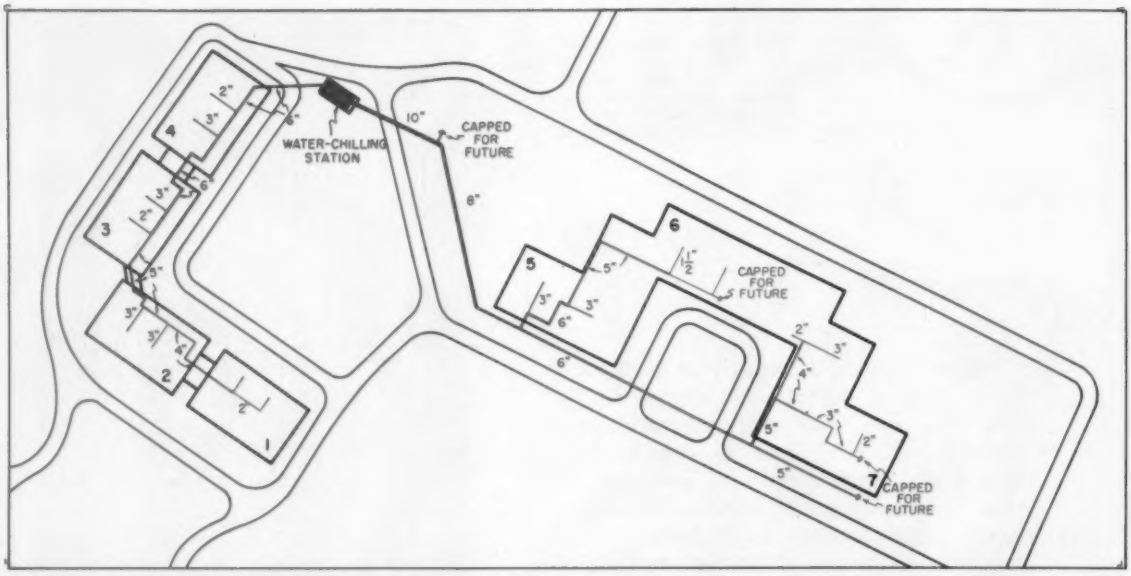


Fig. 1. When you have no basement space for your air conditioning equipment, where can you locate it? IBM and the Carrier engineers decided the best solution would be a centralized water chilling plant for the seven buildings

How IBM Solved Its Air Conditioning Problem

Centralized Unit, Spiral Ductwork Were Some of the Answers

By W. R. DAVIES, Manager, Space Planning, International Business Machines Corp.

WHERE SHOULD YOU locate your air conditioning equipment if you don't have a basement? Here is what International Business Machines did to take care of this problem at its Glendale Laboratories in Endicott, New York.

Seven one-story buildings form this plant, and none have basements. For most purposes, this is a completely practical arrangement. Water and steam lines, telephone conduit and electrical ducts can be located above the ceiling, and the basement is never missed.

But, while air ducts, too, can be run above the ceiling, space elsewhere must be found for the refrigerating and air-handling equipment. Without basements, one big problem was: How can we install air conditioning equipment which would control varying heat loads in seven separate buildings but which would neither gobble up valuable floor space nor present overwhelming maintenance and operating difficulties?

The answer was a centralized water-chilling plant. Two 450-ton Carrier centrifugal refrigerating machines are housed in a small shelter of their own behind the plant buildings. By means of an underground network of 8- and 10-in. piping, the refrigerating equipment furnishes chilled water to 33 fan-coil units in the seven buildings. The fan-coil units are suspended from the ceiling and hidden by simple coverings that blend with the plant interiors.

Outdoor air is admitted through intakes in the roof (three per building), mixed with a proportion of indoor air, filtered and conditioned by the fan-coil units, and distributed through overhead diffusers by means of slim spiral-conduit supply ducts that run above "hung" ceilings.

Spiral Ducts For Tight Spaces

Ceiling suspension of air units—followed in all but four instances—makes for easy tie-in with central chilled-water lines, and at the same time conserves valuable working space below. From the fan-coil units, conditioned air is distributed laterally to ceiling diffusers, where it is discharged gently and without draft into the space. A total of 187,000 sq ft of floor space is air conditioned.

Because of small truss openings and congested above-the-ceiling space, overhead air distribution provided another problem for Carrier engineers to solve. Bar joists at the Glendale Laboratories are located six feet apart on steel cross beams and run the length of the building, while maximum depth from the hung ceiling to the underside of the roof is less than four feet. With struts forming triangular spaces between joists and the roof, conventional rectangular-shaped sheet-metal ducts would have presented almost insurmountable fabrication and fitting problems.

Solution was the use, instead, of thin spiral conduit ducts, in diameters from 5 to 20 in. Rectangular ducts, running parallel to joists, have been used only for main header outlets. Spiral conduit, taking off from headers, carries conditioned air to diffusers which, in most instances, are located in the hung ceiling. Where truss-work obstructed even the installation of the rigid conduit, lengths of air-tight flexible conduit were used to "detour" the line until the path was clear again.

The light weight of conduit (the 20-in. size weighs only seven pounds per foot) reduced manpower required for installing this equipment. So far as lifting and fitting of spiral conduit was concerned, one man was able to do work which ordinarily would require two. Moreover factory fabrication of conduit, and the fact that it

comes in lengths up to 12 ft, which can be conveniently coupled together, made it possible for installation to go on in occupied spaces with little disturbance to plant personnel.

To compensate for differing heat loads in spaces served by a single fan-coil unit, air volume in the network of branch ductwork is regulated by dampering. In addition, temperature of air delivered to specific areas can be regulated by thermostats which are adjustable by maintenance personnel. In the event manual adjustment of dampers or diffusers becomes necessary, access to equipment can be gained without the use of heavy tools—simply by removing a ceiling panel.

How System Functions

In operation, the air conditioning system basically works like this:

Chilled water of, generally, 39 F is supplied by the centrifugal refrigerating machines to coils in the air units stationed in all seven buildings. To conserve water even though it is plentiful in the Endicott area, a cooling tower has been erected for condenser water purposes; it is located outdoors near the machine room.

Outdoor air is provided through three intakes in the roof of each building. Intakes are located, as much as possible, directly above the plenum of the fan-coil units. The units can take 100 per cent outdoor air, but for reasons of economy, a proportion of return air is mixed with the outdoor air and the mixture conditioned.

Return or exhaust air grilles are located along the outer walls of each building, in the ceiling. Overhead space between the ceiling and the roof acts as a return or exhaust air plenum. Exhaust air outlets are located in the roof above the fan-coil units. Dampers on fresh-air intakes and exhaust-air outlets permit adjustment in the proportion of return air which is mixed with the outdoor air and that which is discharged to the atmosphere.

Since air must be reheated at times for best humidity control, the fan-coil units contain reheat coils, as well as standard air-handling components which include filters, fans and cooling coils. Required heat is provided from four of seven centrally-located coilers which supply the plant.

Four of the seven buildings were occupied at the time air conditioning work progressed. This meant careful scheduling of installation work so as not to interfere with personnel work routines. This was a cooperative effort of Glendale Laboratories' Space Planning Department and the Carrier installation crews. Generally, work was planned a week ahead, so that necessary preparations could be taken.

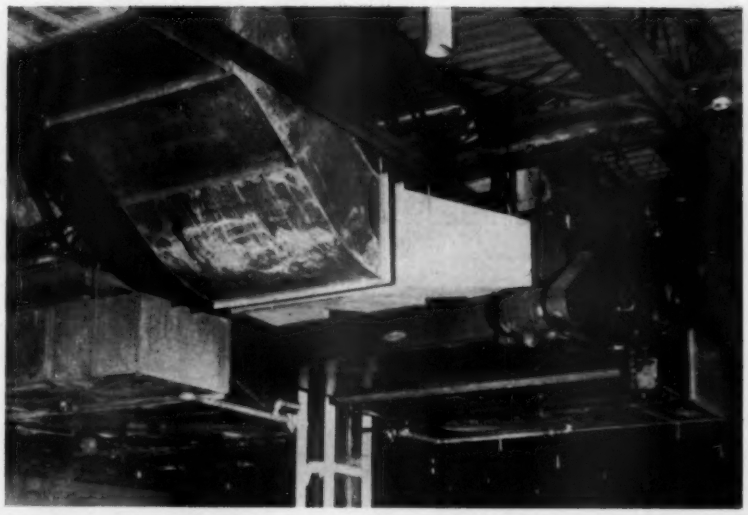


Fig. 2. One of 33 fan-coil units in system with main header duct, foreground

Fig. 3. How spiral ductwork, 5 to 20 in. in diameter, was run between truss-work

Fig. 4. The "hung" ceiling neatly masks the many spiral conduit supply ducts

Fig. 1. Installations of conversion equipment were handled by maintenance men; this is one of the engines affected

Certified's Big Switch to LP Gas

Vehicle Engines Last Longer; Lube Oil Goes Further

IN MANY A PLANT WAREHOUSE using gasoline-fueled fork lifts and tow tractors, the question isn't "if" but rather, "when . . . when should we tackle the conversion to LP gas . . . and how."

That question is doubly acute in smog-bothered industrial communities where management, like their employees, are growing more and more "fume conscious." When conversion comes, usually it is an assignment handed plant maintenance.

One notable conversion job involved 96 warehouse units. The changes were made on fork lifts and tractors belonging to the materials handling fleet serving the Los Angeles Certified Grocers of California, Inc. It may be well to mention that this food distributing and processing organization has at its disposal a million square feet of warehousing area.

During a single month, Certified maintenance men converted the many vehicles from gasoline use to propane. Twenty-five conversions were pushed in a single day on an assembly line basis set up by Jim Nichols, the transportation superintendent. One man drilled holes for couplings and valves. Another ran the lines. A third installed tanks while another adjusted the regulator.

Instead of mounting the tanks vertically on the left side of each lift just behind the fork as some do, Certified's men mounted the propane holders horizontally in the back, above the engines.

Fig. 2. Examples of the general manner of mounting storage tanks on units

As a result, they are easier to replace; their fuel lines are somewhat shorter and run no chance of interfering with the fork's operation.

Basically, conversion kits consisted of two four-gallon tanks (service and auxiliary) a regulator, an adapter for the gasoline carburetor, a filter between the propane tank and regulator, a quick coupling flexible fuel line and various other lines. Conversion costs, labor included, ran about $160 a unit.

What are the benefits of this conversion? Warehouses, once hazy with fumes, are clean-aired and workable. More interesting from a maintenance point of view: engine life has been doubled, the time between oil changes upped 500 per cent, the cost of major engine overhauls sharply reduced.

Formerly, too, valves and carburetors were notoriously short-lived. Today, in propane-burning engines, they are lasting months longer.

Engine oil scheduled for a change every 80 hr is now changed every 400 hr—a five-fold increase in oil life. Previously, fork lift engines were routed through the overhaul shop every year; some needed overhaul months sooner.

Actually, the new oil change schedule is not unusual at all. It is, in fact, an extremely modest change schedule and Certified expects, with more operational data, to extend it even longer. One fork lift operator ran a 2-ton unit more than 3270 hr on its original five quarts of oil. There was no attempt to set a record. Frequent oil samplings by an independent lab merely showed a change was not necessary.

This switch to propane goes back to 1951 when warehouse fumes became bothersome to the point where they could no longer be ignored. By 1953, after studies of various remedies were made, several units were converted to propane as test vehicles. But while inspection of their engines and lube oil analysis all pointed to sizeable maintenance savings, the handful of propane units in the warehouse had little observable effect upon fume reduction. It was realized that only a complete change-over would accomplish the job. In 1954 the big switch was made.

Of course, research for a long time has pointed to LP gas as far less irritating than gasoline. One reason is that propane throws off 14 times less carbon monoxide than gasoline. This is an important point in confined spaces where ventilation may not be the best. Additionally, LP gas burns as a dry fuel, gasoline as a wet fuel. Fuel cutoffs, self-locking couplers, high pressure design all contribute to the safer use of LP gas.

There are two noteworthy developments bearing on the overall conversion job: 1. An effective propane indoctrination course. 2. A unique system for refueling all 96 units.

Fig. 3. Foreman, holding regulator, seen standing beside instruction layout

Transportation superintendent Jim Nichols and mechanical maintenance foreman Andy Sherwin set up the propane indoctrination course. On a big board, shopmen rigged a "mock-up" of the propane systems going into fork lifts and tow tractors. Included were the four-gallon propane tank, flexible safety lines, lock-off solenoids and

(Continued on page 258)

Fig. 4. "Octopus" setup is used to refill the tanks carried on special carts

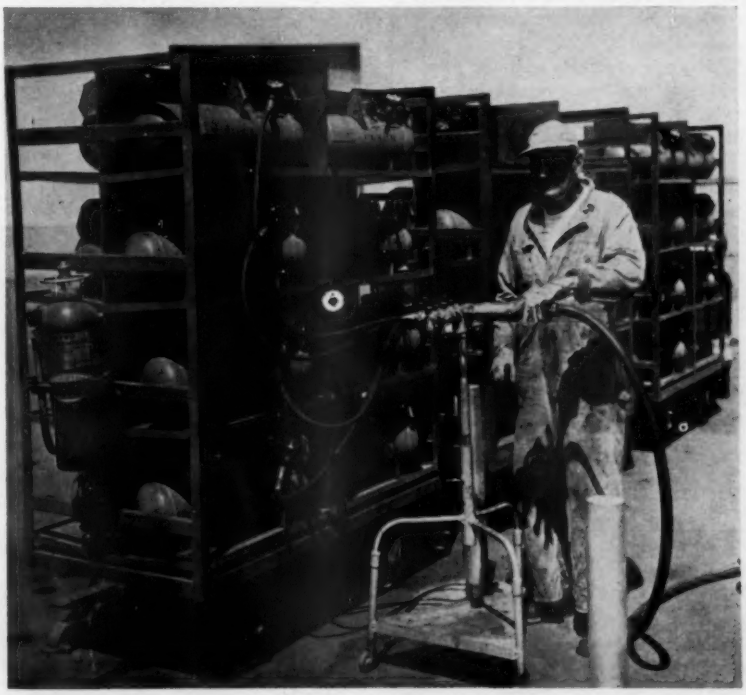


Fig. 1. Speed clips secure vapor barrier insulation which was impaled on pins welded to air duct

Semi-Rigid Duct Insulation—

Take Your Choice of Variety of Application Methods

SEMI-RIGID, spun mineral wool duct insulation is easily shaped to conform exactly to duct surfaces. The material can be readily cut and shaped to fit the duct snugly and squarely. In addition, its firm, relatively smooth exterior surface may be spray or brush painted.

Suitable for the insulation of heated surfaces at temperatures up to 400F, spun mineral wool duct insulation has a thermal conductivity comparable to non-rigid materials. Thermal conductivity of a typical semi-rigid duct insulation is given in Table I for mean temperatures likely to be encountered.

The excellent noise reduction efficiency of semi-rigid duct insulation is shown by the sound absorption coefficients in Table II.

Table I. Mineral wool conductivity*

Mean Temp Deg F	Thermal Conductivity k
0	0.21
25	0.22
50	0.23
75	0.24
100	0.25
200	0.29

*Baldwin-Hill Semi-rigid duct insulation

Duct insulation is available in three forms—plain, with a factory applied vapor barrier, or with a neoprene coating. Standard sizes are 2- by 4-ft panels ranging in thickness from ¾ to 2 in. The material has a nominal density of 7 lb per cu ft.

Warm Humid Areas

Vapor barrier duct insulation is covered on one side with a heavy black kraft paper coated with asphalt. For use in warm humid areas where condensation is a problem, the factory-applied coating eliminates the necessity of applying a vapor barrier on the job. Because asphalt may soften, it is not recommended for use at temperatures in excess of 150F.

Applied as a lining inside ducts, neoprene coated duct insulation reduces fan noise by preventing its transmission into areas served by the system. Applied to duct exteriors, it damps sheet metal vibration and reduces duct noise in areas through which the system passes. The neoprene coating facilitates painting.

Semi-rigid duct insulation may be applied directly to outside surfaces of ducts and secured by tapes, wires, bands, adhesives, or impaled on clips, pins or wires fastened to duct surfaces.

Surfaces to be insulated must first be free of loose rust, scale or dirt. Before applying adhesive or before welding mechanical fasteners to sheet metal surfaces, remove all oil, grease, paint or other coatings that might interfere with bonding.

The most economical method of application is the one shown in Fig. 2. This technique is fast and requires the least skilled labor. It is usually specified for ducts in lofts and above suspended ceilings.

Apply welding pins or mechanical clips (using recommended adhesive) to under surfaces of horizontal runs and on all four sides of vertical ducts. Use

Table II. Frequencies vs coefficients*

Cycles/sec	Sound Absorption Coefficient
125	0.32
250	0.58
500	0.70
1000	0.93
2000	0.95
NRC	0.80

*Based on Baldwin-Hill, 1-in. thick insulation applied to duct interior

at least one fastener per 2 sq ft of surface. Apply adhesive in 4-in. wide strips at 1-ft intervals to other three sides of horizontal runs. Ridge adhesive slightly with a serrated trowel.

Cut duct insulation in widths and lengths to conform to duct surfaces. Cut top and bottom pieces to overlap side pieces. Cut side pieces slightly to oversize to insure snug fit.

Apply bottom piece first, impaling it on the pins or clips and securing it either with washers or speed nuts or by bending the fasteners. Apply the side pieces and then the top by pressing the material firmly in place.

If vapor barrier insulation is used, seal all joints with a 3-in. wide vapor barrier tape adhered with a vapor sealing, flexible adhesive. Cover all fastener heads with at least a 3-in. patch of tape.

Sealing of Joints

Seal joints of regular and neoprene coated duct insulation with a 3-in. strip of pressure sensitive tape. Loop tape around circumferential joints.

Insulate light gage metal ducts of large cross section by the method in Fig. 3 when projection of the screws into duct is permissible.

Use No. 10 or 12 gage galvanized or stainless steel screws and fiber or metal washers 1½ in. in diameter. Screws should be ½-in. longer than the thickness of insulation. Drill holes in duct to accommodate screws and fasten insulation with at least one screw and washer for each 2 sq ft of surface. Screws should be applied as near duct edges as possible for maximum support. When fastening, make sure each screw takes firm hold.

Cut, fit and seal the insulation in the same manner as when fastened with clips and adhesive.

Use the method in Fig. 4 to insulate ducts of large cross section where penetration of the duct cannot be permitted.

Attach pins, wires, lugs or clips to all duct surfaces as specified for vertical ducts and horizontal under-surfaces in the first method. Cut and fit the insulation as before. Impale panels on the fasteners, pressing them tight against the duct surface. Secure with speed clips or washers or simply bend the ends of the wires or lugs.

Seal with proper tape as previously described. If a smooth finish is required, clip off any excess metal to leave an even surface.

Method in Fig. 5 can be used on ducts up to a maximum width of 24-in. If used on wider ducts, mechanical fasteners are required to provide intermediate support on the bottom horizontal surfaces.

Cut panels of insulation to fit, top and bottom panels overlapping side panels. Wrap circumferential bands or wires around duct loosely and slide one course of insulation under them. Insert sheet metal angles at all four corners and draw the band or wire tight, securing it with seals or ties. Use of adhesive to hold panels in place temporarily may facilitate application. Seal joints as before.

To reduce fan and turbulence noise, apply neoprene coated duct insulation to duct interiors as in Fig. 6.

Cut insulation to fit inside the duct so that the side panels overlap the top and bottom pieces. Apply rubber adhesive to side and bottom surfaces in 4-in. strips on 12-in. spacing and ridge it with a serrated trowel. Press side and bottom pieces, neoprene coated side out, firmly in place to insure a good bond. Apply the top piece and secure it with pins, clips or wires previously attached to the duct surface, or with screws and washers. Point all insulation joints with a fire retardant adhesive to insure tightness.

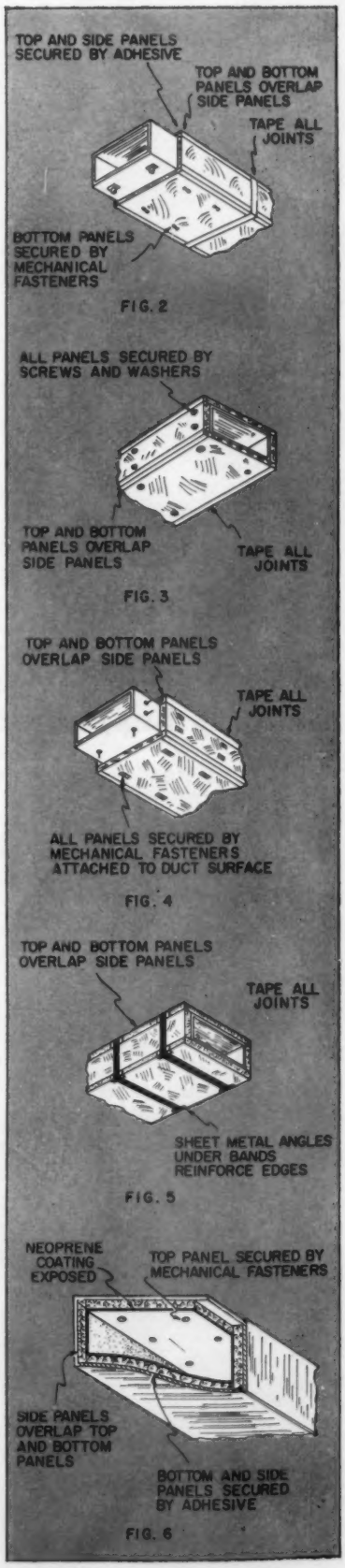
Duct insulation may be left unfinished or may be finished in a number of ways. Common finishes are canvas, asbestos paper, insulating-finishing cement, paint or weatherproofing compounds.

Surface Finishing

To finish with canvas or asbestos paper, use a cement designed for the purpose to adhere 6- or 8-oz canvas or 12-lb asbestos paper to the insulated duct. To further improve appearance and provide sharp, square corners, bend 26- or 28-gage galvanized metal or thin aluminum around all corners.

To be finished with white mineral wool insulating-finishing cement, the duct insulation must be impaled over welding pins or other mechanical fasteners which are approximately ½-in. longer than the insulation thickness. After the semi-rigid material has been secured with clips, apply wire mesh or metal lath over all four surfaces and tie corner bead to all edges. Secure the lath or mesh on the same fasteners holding the duct insulation. Apply a minimum thickness of ⅜-in. of white mineral wool insulating-finishing cement to the surface and trowel to a smooth finish.

On outdoor ducts, first finish duct insulation with white mineral wool insulating-finishing cement using method described above. After the cement has dried thoroughly apply a tack coat of asphaltic mastic using 4 gal per 100 sq ft. While the mastic is still wet or tacky, press a layer of woven glass cloth into it and then spray on a final coat of mastic using 8 gal per 100 sq ft. Paint duct insulation with a rubber base paint.


TOP AND SIDE PANELS SECURED BY ADHESIVE
TOP AND BOTTOM PANELS OVERLAP SIDE PANELS
TAPE ALL JOINTS
BOTTOM PANELS SECURED BY MECHANICAL FASTENERS
FIG. 2
ALL PANELS SECURED BY SCREWS AND WASHERS
TOP AND BOTTOM PANELS OVERLAP SIDE PANELS
TAPE ALL JOINTS
FIG. 3
TOP AND BOTTOM PANELS OVERLAP SIDE PANELS
TAPE ALL JOINTS
ALL PANELS SECURED BY MECHANICAL FASTENERS ATTACHED TO DUCT SURFACE
FIG. 4
TOP AND BOTTOM PANELS OVERLAP SIDE PANELS
TAPE ALL JOINTS
SHEET METAL ANGLES UNDER BANDS REINFORCE EDGES
FIG. 5
NEOPRENE COATING EXPOSED
TOP PANEL SECURED BY MECHANICAL FASTENERS
SIDE PANELS OVERLAP TOP AND BOTTOM PANELS
BOTTOM AND SIDE PANELS SECURED BY ADHESIVE
FIG. 6

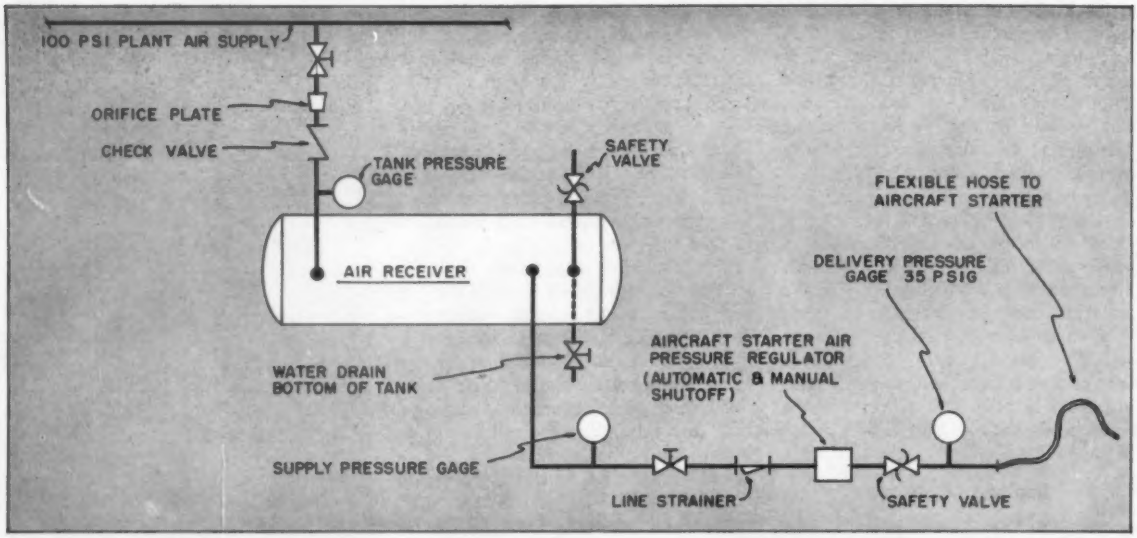


Fig. 1. Sequence of auxiliary air supply for starting jet engines, from plant compressed air system to air turbine starter

Compressed Air on Reserve

Auxiliary Supply, Bled From Plant, Stored, Starts Jet Engines

By C. C. CASIDAY, Special Projects, Plant Engineering Dept., El Segundo Div., Douglas Aircraft Co.

AN EFFICIENT compressed air system in any industrial plant must have sufficient reserve capacity for peak load requirements. This means that during periods of normal compressed air usage, the compressors will be inoperative a certain percentage of the time, cutting in only to replenish the supply when air pressure in the receivers reaches a pre-determined minimum.

If, as happened at the El Segundo Division of Douglas Aircraft Company, a need arises for a large amount of compressed air over a short period of time, but only at spaced intervals, what would ordinarily be downtime on the compressors can be effectively employed to supply this need, and at much less cost than installing a large compressor.

Here is the way we handled this problem at the Douglas plant. We needed an auxiliary compressed air supply for starting jet engines. This would have to be a very large supply, as about 75 lb of compressed air per minute are required to operate the air turbine starters, and the average engine start takes about 30 seconds. Frequently, more than one engine is being started at a time. A compressor that could furnish this amount of compressed air during the short time it would be required would be large and costly indeed.

A second alternative was to install receiver tanks at the various test cell locations and fill them with small compressors that would operate between the engine starts. This, too, would have been costly, as five separate receiver tanks varying from 10,000 to 13,000 gallons in capacity would be required. Five small compressors would have had to be purchased to fill them.

Then came the idea that proved most economical of all—install the required receiver tanks, but fill them by bleeding air from the compressed air systems already installed at the various hangar locations. Thus, what would ordinarily be downtime on the hangar air system compressors could be used in filling the receivers for engine starting.

Carrying out this plan imposed several problems. First, the amount of air bled from the hangar compressed air system must never be sufficient to interfere with the supply used for operating the numerous hangar air tools. This was solved by controlling the size of the orifice used for bleeding the air into the engine starting receiver tanks. Calculations showed that a ¾-in. orifice would bleed approximately the same amount of air from the system that would be used by a large air motor and that this load could be added to the hangar systems without endangering its reserve capacity.

Secondly, as the amount of air bled into the engine starting receivers was limited by this ¾-in. orifice, the receivers had to be large enough that an engine could be started without consideration of any compressed air entering the receiver during the start. This problem was met by installing five receiver tanks in all, varying from 10,000 to 13,000 gal capacity, and and serving 11 engine starting positions on two different lines. An average engine start from any one of these receiver tanks causes a pressure drop of approximately 5 psi. Furthermore, because several tanks are used, several engines can be started simultaneously without endangering the air supply.

The hangar compressed air systems operate at 100 psi. The air is bled into the engine starting receivers at the same pressure. This pressure is not affected until the air actually enters the engine starting cells, where pressure regulators are used to reduce it to the 35 psig required to operate the air turbine engine starters. Because of the danger to costly equipment involved, pop-off safety valves as well as

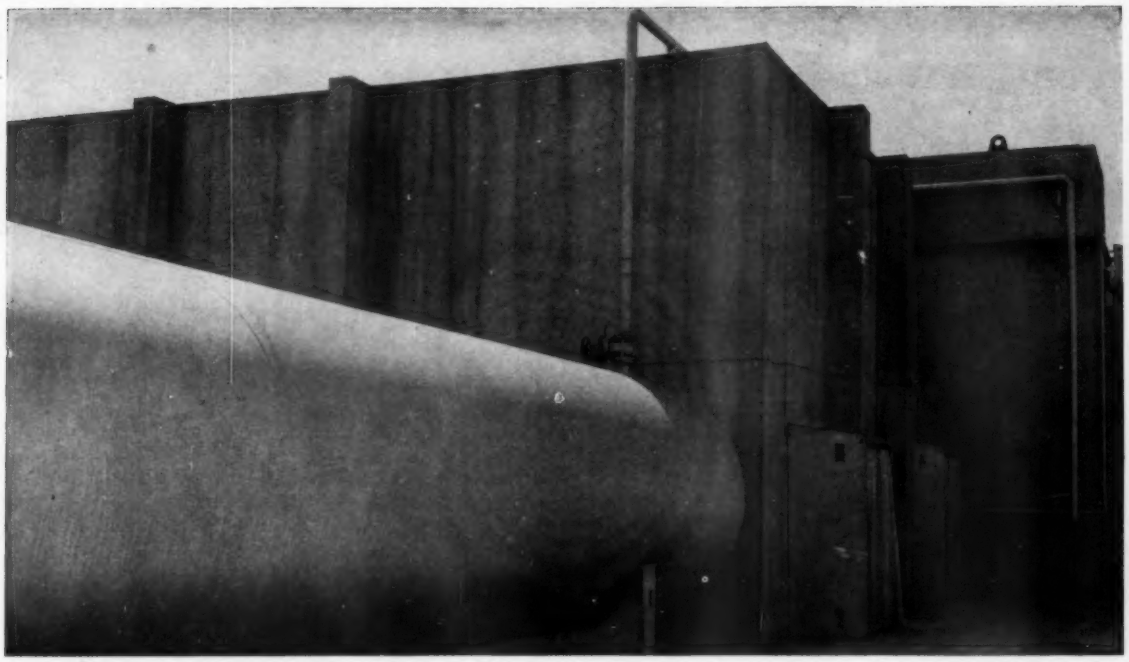


Fig. 2. Air receiver is installed next to engine silencer. Air pipe is tapped from tank top to minimize moisture transfer

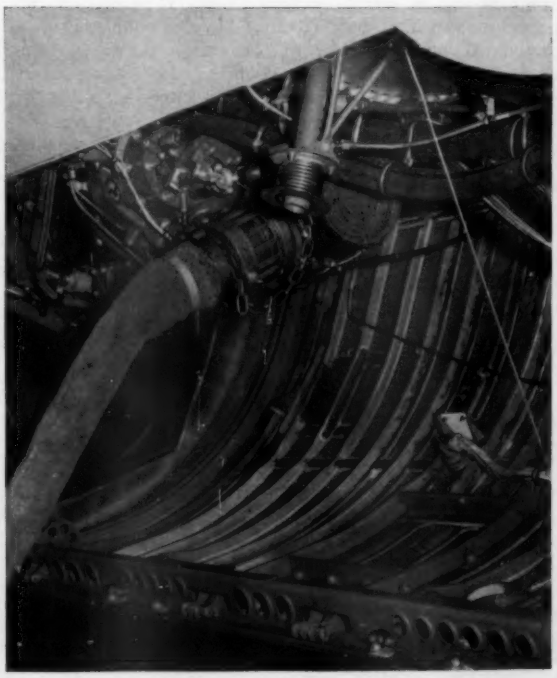
pressure regulators are installed in each line beyond the pressure regulator valve.

Ordinary four-inch air pipe is used to bleed the air from the hangar systems to the engine starting receivers. Over-all, about 1000 ft of air pipe was installed. This pipe, of course, culminates in the ¾-in. orifice where the air enters the receivers. Strainers, water traps, and shut-off valves were installed where necessary. Standard parts and accessories were used throughout to facilitate repair.

The only cost involved in operating this auxiliary bleed-off compressed air system is in the extra wear, maintenance, and power used to operate the hangar compressors during what would normally be downtime. When installing such an auxiliary system for an intermittent supply of large amounts of compressed air, plant engineers should take into consideration that installing large receiver tanks represents but a small increase in cost over installing smaller tanks.

Fig. 3. Air enters test cell at 100 psi, leaves at 35 psi

Fig. 4. Air line is attached to turbine starter on jet engine



Establishing The Maintenance Budget

1. The "Why" of a Budget

2. Developing the Measuring Stick

3. In Continuous Process Industries

4. In Repetitive Process Industries

5. In Intermittent Process Industries

By CLARENCE W. LERY, Industrial Engineering Consultant, Chicago

1. The "Why" of a Budget

THE PURPOSE of any business enterprise is to earn a profit on the invested capital. In order to keep itself solvent, the business enterprise must have a plan of operations. This plan of operations is usually called the "sales forecast." Based on this sales forecast, the company sets up guides to keep it on the correct road to a profitable business period. A budget is one of the chief devices used by management to guide it to a definite profit goal.

A business budget may be likened to a road map that we take with us on a vacation. We know where we want to go, and we know the road to take, but to be safe we take the road map. Usually we drive the main highways, and keep ourselves on the accepted route to our destination. So does business.

Sometimes we see a sign telling us of a particular point of interest, and we decide to see it. So we check our road map to see how far off our course we will go, and how we can best get back on the correct route. Usually we also check the time we have and the amount of money with us. Will we have time to drive the extra miles, and do we have the money for the additional night out and the meals?

A business must do the same thing. A new machine may be faster, but do we have the time to shut off production until we can get it installed? It may be just as economical to buy the new equipment as to repair the old, but one cost comes out of our profit as a capital investment, and the other can be charged as a repair or running expense.

Budgets, therefore, are guides set up by the managers of a business to tell them how much time they have to fabricate their product, how much of that product they are going to make, how much money they have to spend in making it so that the business may end its period with a profit.

Why Maintenance Budgets? Up to this point we have held the interest and attention of plant engineers. About now a few wander off, in complete agreement that budgets are necessary—for production departments—and that every well run business should have one—for production departments. Traditionally this has been so, but conditions have changed drastically in a rather short period of time.

Not too long ago the maintenance department consisted of a few "repair men and grease monkeys" stuck in a cold damp corner of the plant. They did some minor repair work, greased the equipment, and kept the buildings in a fair state of repair. Any serious repair work was sent back to the manufacturer, or repair men were brought in to do the work.

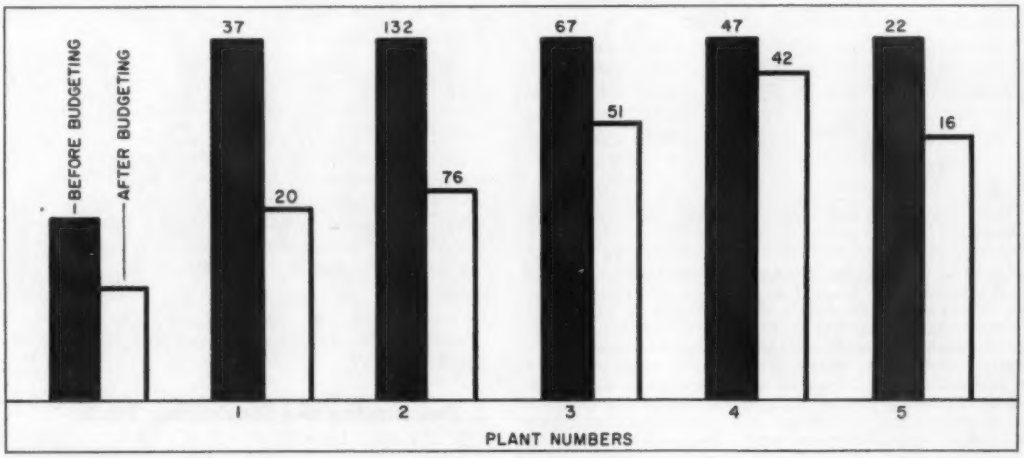
Then came the series of machine tool and production tool changes and improvements. First it was Mass Production, and then Technocracy, and during World War II it was Mechanization. The greatest growth in machinery and equipment has been since the end of the war, and it is now called Automation.

By whatever name it is called, to the plant engineer it merely means that his duties and responsibilities have again been increased.

To the general public, it means that more machines have taken the place of men, and we are headed into another dismal period of unemployment.

To the plant engineer, it means that he has to take these displaced machine operators and make maintenance mechanics out of them. Where it was once the normally accepted ratio of one maintenance man to every 100 (or more) direct production workers, the ratio in certain process industries now is one maintenance man to ten or less production workers.

Reduction in Maintenance Labor Due to Standardization and Budget Recording



This chart shows how maintenance labor can be established at proper levels through adequate standardization

Plant No. 1 carried a number of direct labor functions as its regular maintenance load, and as result had a high indirect labor cost. The company is in the electronics field, and competition forced it to make a careful analysis of all activity. As a result of the analysis and standardization of duties and work, the number of men charged to the maintenance functions was reduced from 37 to 20, a reduction of 46 per cent. The department was able to do a better job, duties were set to eliminate "buck-passing," and productive output was increased.

Plant No. 2 was a food processing plant where the duties were performed in an overlapping schedule which resulted in considerable lost time, and duplication of the same functions. Revising the duties, and the order in which they were performed resulted in a 42 per cent reduction in the personnel involved.

Plant No. 3 is a metal working plant where an excellent program existed for repair work, but where the functions of the crew and timing were not considered. More accurate standardization of work functions and scheduling of activities gave them a 24 per cent reduction in crew size.

Plants Nos. 4 & 5 are two companies in the plastic molding field on their second round of attempting to improve their cost picture. At the original set-up of the program various weaknesses were pointed out, and both companies went into training programs within the plant. Results were additional savings of 9 per cent for one, 27 per cent for the other.

While, admittedly, changes in accounting procedures have been partially responsible for the change in charging labor, the tremendous swing from operators to maintainers is not ended.

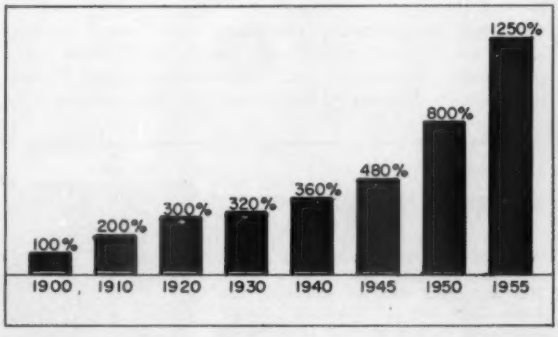
Thus we end with one conclusion as the only possible end result: Like it or not, the trend is now to more and larger maintenance departments. With these larger and more numerous departments goes a larger share of the money industry has to spend. With this increased responsibility for the expenditure of funds comes a greater necessity to know where the money is going, and what industry is getting in return.

To exist as a money-making organization it becomes necessary that industry control its maintenance departments with a hand on the purse strings—through budgets.

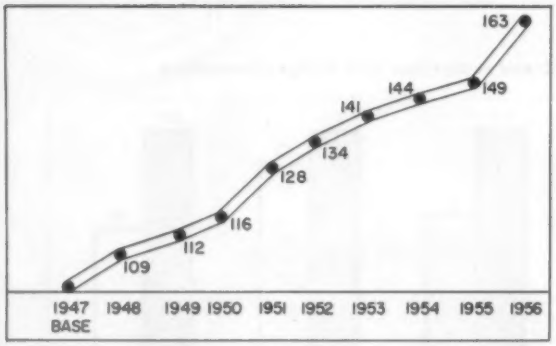
While the rising ratio of maintenance workers to direct production workers brings them to the fore as one of the more important facets of industrial expenditures, the increasing number and value of the machines used in production have made the individual maintenance man more important in the battle to get out production.

Increasing use of machines, and their interconnection in a series of chronological operations, or machine lines, makes the necessity of keeping each piece of equipment in continuous operating condition an essential prerequisite of good business.

We have a situation where the cost of equipment is rising, while at the same time the need for the equipment becomes more urgent. These two make for more work and responsibility on the part of the men maintaining the equip-



Increase in number of machines in use in industry in the United States, as shown in the above chart, reflects the true magnitude of industrial growth in this country. The amount of equipment has doubled each decade, except during the 1930's, and the growth since 1940 has been phenomenal. Increase in number of machines, in the capital investment, in the machine-hour output and the value of that output, has increased the responsibility of the plant engineer. As the number of workers and dollar expenditures continue to mount so does the necessity to control maintenance costs



There is little doubt in the minds of anyone that all expenditures are increasing. Individual items in the plant budget are seldom examined as closely as they might be. The above chart shows the actual rise in maintenance costs in a select group of plants in the Chicago area. Figures shown are for "normal" years after World War II. The constant rise in these expenditures is far above cost increases in other operations of the same plants. This demonstrates the result of growing mechanical operations and their resultant importance in the companies' fiscal plans. Figure shown for 1956 has been computed on a base of first ten months of 1956

ment, and conversely reduce the work and the required number of men involved with operating the machines.

Maintenance has become a factor in production, and as a factor in production, is a first cousin to direct labor. Since it is now as responsible as direct labor for the productive output of the plant, it follows that it is as chargeable as direct labor.

It is the fond hope of the author that the foregoing will provide plant engineers with adequate reasons for budgeting maintenance costs. Our only problem now is to devise a just method of setting the budgets.

Types of Maintenance—The total field of maintenance can usually be divided into two sub-groups or portions, 1. Construction; 2. Repair, or Running and Cleanup.

Construction Maintenance generally has to do with the actual building of new and/or additional physical facilities to house productive operations. Such types of work are undertaken after agreement that the expenditure is necessary, and after the general size and type of the work has been decided.

It is customary that a building contractor do the actual work, with the plant engineer controlling and overseeing the operation.

Normal Maintenance, sometimes called repair maintenance, (or running maintenance, mechanical maintenance, production maintenance, etc.) is our prime target. Normal maintenance consists of those regular (daily, weekly, or monthly) functions of the plant maintenance department, the repair of breakdowns in plant or productive equipment, and regular cleanup operations. For budgeting purposes this normal maintenance is sub-divided into three separate items: 1. Preventive Maintenance; 2. Repair Maintenance; 3. Cleanup Maintenance.

Preventive Maintenance consists of programmed services to reduce accidental breakdowns, increase normal machine life, and to standardize overhauling and repair jobs on production equipment.

Repair Maintenance consists of immediate unplanned repairs of unexpected breakdowns which cause production delays. Moving equipment to new locations, revising equipment for special operations, and complete overhaul or rebuilding of production equipment are also included.

Cleanup Maintenance consists of services to production departments necessary for safety, sanitation, and good appearance, such as sweeping, window washing, machine cleaning, snow and ice removal, repair of doors, windows, partitions, floors, stairwells, etc.

2. Developing the Measuring Stick

PURPOSE OF a budget is to set a goal or standard to which actual performance can be compared. The real test of the necessity and usefulness of a budget for maintenance departments is our ability to set up a just measuring stick against which to judge their operation.

Maintenance operations are like the industries they service, and are as many varied as these industries. The budget set up must take into consideration the major variables that occur in setting up and operating the maintenance department which it is to control. Size and type of plant will dictate the amount of work there is for a maintenance department. This, in turn, will dictate the type of budget to be used. Obviously a large plant with millions of dollars tied up in physical property and machinery must have a large and varied maintenance program, i.e. a large job shop with a multitude of machining operations. Another company, with little or no equipment, i.e. assembly departments where parts are purchased, could have as large a sales volume in dollars, and yet have no maintenance program as such.

Most important consideration in setting up any program is to consider the activities it is to cover. The size, type, and number of machines involved, the variety of operations required, and the dependence of the productive process on any one piece of equipment will be determining factors in setting up the maintenance program, and the budget program to cover it.

Existing maintenance programs should be used to build up any new or revised program under a budget, and hence must be considered. Any good or useful portions of the existing program should be incorporated into any new program, and any innovations should follow, as closely as possible, the existing methods. It is difficult for people to change their methods of work, and any concessions to existing methods will be advantageous in promoting essential revisions. Type of industry is the prime control of the maintenance program.

Continuous Process Industries, those where the product flows through a fixed series of operations, usually have the highest dollar investment in machinery and equipment. Due to the type of processing involved, it is essential that all equipment run as scheduled, and the maintenance program must be geared to the company program.

Repetitive Process Industries, those where high speed production is required but where minor interruptions of the schedule do not mean a heavy monetary loss, need a flexible maintenance program.

Intermittent Process Industries, those of the short run,

About the Author

Clarence W. Lery has been in industrial engineering work since 1940. His particular field of endeavor has been, thus far, in electrical manufacturing and assembly studies, in food processing, metal and plastic manufacturing. He is, at present, Instructing Engineer at the Industrial Engineering College in Chicago. He still finds time to take care of special assignments in management consulting.

non-repetitive type of product, need a program designed to give them the greatest possible number of machine hours.

To handle the budgeting of maintenance programs there are several acceptable methods of charging the expenditure, depending upon the company's policies and the accounting procedures.

Budgets can be based on *Dollar Volume of Sales,* where the budget will vary with business conditions, and where an adequate maintenance program may not be possible due to these variances in economic conditions.

Man Hours of Direct Labor, is a more acceptable method of setting maintenance budgets, but this too, is dependent on over-all sales, and does not take into consideration the needs of a good program, which does not always reflect company business.

Productive Machine-Hours is a good method of setting maintenance budgets, since any actual machine-hours should reflect the wear and tear on the equipment. The problem arises in that actual machine-hours do not always reflect total goods production; it could show a sales situation that does not exist because of unfinished units or incomplete piece parts.

Saleable Units Completed, is generally the most acceptable form of setting the required budget allowance. By computing on the basis of units, the dollar value variations due to economic conditions is eliminated. By computing on saleable units completed, the maintenance program can be balanced across all required operations, since the completed unit must go through all operations. By using the "saleable unit" designation it forces production departments to reduce scrap, and the maintenance department to see that the equipment is in condition to make only good units.

The above points are mentioned only to illustrate that certain types of budgetary programs are not always equitable, and that it becomes important, as the program is formalized, to decide upon a fiscal program that accurately reflects those items which are important in computing budgetary allowances for maintenance departments.

3. In Continuous Process Industries

CONVERSION OF A RAW material into a finished product in a series of fixed operations, where any stoppage of the processing would cause a heavy loss, is considered to to be typical of a continuous process industry.

Petroleum, iron and steel, grains, food processing, and certain phases of the plastics industry are examples of this type of industry.

The loss may be in a chemical reaction which cannot be halted or a cooking procedure where any stoppage would either spoil the product or cause the loss of the heat and a resultant delay to reheat.

Continuous process means uninterrupted flow, and the processing equipment is usually joined by mechanical means of material handling to eliminate any human error. Such processing equipment is usually designed for a single purpose, and is heavy, large, and expensive.

Production is generally based on the maximum output of the equipment. Production control schedules are for long periods of time, and tend to be inflexible. Production and direct labor are usually scheduled by line-days (eight hour shifts) and frequently run on a 24-hr basis.

Type of Maintenance Scheduling—*1. Preventive.* Since production scheduling and actual sales are tied closely together, and production scheduled for long periods in advance, complete shutdowns for overhauls are scheduled in advance. The shutdown period is computed on the basis of total hours of production or total volume of production, whichever is the sounder basis for wear.

Number of maintenance men required for such work can be held to a minimum, and the work scheduled in such a fashion as to keep one or more crews busy all year on overhauls. Any time not accounted for because of easy or difficult work can be handled by having the next production line to be taken down fill in for the required time; that is, to run an extra day or two, or to shut down a day or so earlier.

Total extent of wear or deterioration cannot be positively ascertained until the equipment is disassembled. The exact time necessary for the overhaul operation cannot be definitely known until the necessary work is known. It is for these reasons that the above mentioned lapover in the running schedules is required.

Where there is sufficient volume of work to keep one or more crews busy the greater part of the year, it is advisable to hire an industrial engineer-estimator. Accurate work standards can be set and the time, material and cost can be forecast. In addition, by comparing the standard allowance against actual usage, it is possible to effect considerable savings in materials.

Where there is not sufficient volume of work to warrant a full-time engineer, it might be possible to borrow one from the production department. The success of companies using such procedures is sufficient proof of their worth. The chronic complaint that it is impossible to set standards on repair and maintenance work as is done with production work doesn't hold water.

One does not repair a high-speed turret lathe in the same manner a wooden pallet is repaired—but they both get repaired. While the same techniques may not be applicable, all work should be covered by standards. The benefits accruing from knowing which jobs went over the standard, and hence where to check for possible improvements is sufficient reward.

Where it is not possible or practical to set accurate

PLANT		DEPT.		
DIRECT AND INDIRECT LABOR STANDARDS				
Oper.	Station or Activity	Equipment	Labor Hours	Actual Labor
1.	Feed pulverizer	A200-O	1.00	
2.	Check material & watch conveyor		1.00	
3.	Blend ingredients	A74-M	1.00	
4.	Feed cooker	A16-H	.50	
5.	Check temperature		.50	
	Total Direct Labor		9.50	
1.	AM check on 3rd floor equipment		.75	
2.	Oil & grease		.40	
3.	Check heat lines		.25	
4.	Inspect gages		.45	
	Total Indirect Labor		5.90	

This is a sample of a form that might be used in a continuous process industry for recording activity of both direct and indirect labor. The form actually was used in a candy processing plant where maintenance labor is assigned by line schedule and budgeted by actual line production

standards, the next best tools must be used—past experience, good record keeping. The important phase of maintenance is the keeping of adequate records of the work necessary at each shutdown, and the time required. In this manner excellent records can be set up which will tend to eliminate guesswork, and to minimize unexpected breakdowns by preplanning for them.

It might be well to remark here that a good record clerk is more economical salary-wise and far more reliable estimating-wise than the best maintenance man.

2. Repair. Regular daily maintenance can best be handled in this type of industry by patrol crews assigned by area or type of function. These crews should be decentralized for the working shift, and be available in their area for any breakdown or repairs. The purpose is to keep the lines running if possible, or to reduce down time to the bare minimum.

A regular schedule of testing, adjusting, and periodic inspections should be set up, and a definite follow-up on the assigned schedule should be made by both maintenance supervision and production supervision. Adequate use of this type of preventive maintenance reduces actual repairs and lost time to the minimum.

These patrol crews should be set up for the minimum number of men, mixed to cover the various craft work that might be required, with supervision to check their work and efficiency.

Whether or not this type of system will work is determined by the worth of schedule set up for regular work, and the follow-up by supervision. It becomes the duty of the production supervisor to see that the necessary work is done on schedule, and the duty of the maintenance supervisor to examine the work to see that it is done properly.

Schedules should be set up to handle all regular functions of the maintenance department—greasing, oiling, changing of filters, gaskets, light bulbs, fuses, gages, recording devices, and all mechanical adjustments, tightening, inspections, etc. The crew works as a miniature maintenance department in its own area.

These crews can also do a fair share of the heavy maintenance or overhauls by preparing for the work to come, by working with the overhaul crew, and by being loaned to other areas when an exceptional job comes up.

3. Cleanup. The cleanup function can be scheduled in the same fashion as the regular daily maintenance. A standard cleanup crew can be organized, and the various functions can be set up and scheduled on a time basis. Window washing, floor scrubbing, floor waxing, machine cleaning and other regular duties of the plant are set up on an occurrence basis, and the frequency of occurrence based on the line hours scheduled for the production units.

Other items that are included in the clean-up function; collecting scrap, separating waste materials, floor sweeping, and such items as are dependent on regular production would be set up with the production schedule. The amount and type of functions that could be so set up would depend on the industry and the type of operations that occur.

Setting the Budget—Setting up the budget for a maintenance department in a continuous process industry follows the same pattern as that used for direct labor.

Actual production is tied closely to sales, and is set up for a definite period. Due to the necessary tie-in of raw material the production schedule cannot easily be changed. The maintenance crews can be set up with the regular production schedule, and work within it. The preventive crew has been set up to disassemble, repair, and reassemble the equipment after a given number of hours of production.

Using the total computed man-hours of repair time against the total hours of production between shut downs, we have an overhaul charge per hour of production. This preventive maintenance charge can be added to the direct labor cost standard, and thus compute the necessary maintenance into the manufacturing cost and then into the selling price.

In this way the sales price of the product represents a truer processing cost. Maintenance charges on the direct labor standard will be gathered into a deferred account and held until the actual work is performed.

The same type of budgeting is applicable to the patrol crew and to the cleanup crew. A standard crew is set up to cover the necessary work duties based on full production. These crews are then apportioned by the number of lines they are capable of covering, and the appropriate charges made by account and line hour of production. Since these are actual charges to the productivity of the line, they are charged on a daily or weekly basis.

In such a fashion the plant engineer knows where each hour of labor is charged, how his crew is distributed, where he can draw men, and where he is over-staffed. It gives him an opportunity to check the size of his crew and the number of men in each craft against his actual needs. He will be able to set up a training program for new men, and a replacement schedule for those who do not fit into the plants' requirements.

4. In Repetitive Process Industries

AN INDUSTRY where the same unit (with minor variations) is fabricated over and over again is a repetitive process industry. As its name implies, it is a repetition of operations. Repetitive processing is a continuous type where the materials are such that work can be started or stopped at any time without abnormal waste.

Interchangeable parts are one of its major requirements, and it is more commonly known as "mass production" or "line production." Automobiles, radio-TV, refrigerators, washers, and similar products fall into this group.

Repetitive manufacture is characterized by a series of operations, each independent of the others, but set up in sequence or line. Material flows from one operation to another, usually by mechanical means, until the unit is completed.

Because the material is not perishable the mechanical failure of one operation may cause a loss of labor, and a decrease in output, but these can be recovered by shifting the workers to other operations and by working a greater number of hours.

The maintenance function differs considerably from that found in a continuous process. In continuous processing

MAINTENANCE DEPARTMENT

CREW SUMMARY SHEET — DEPARTMENT 16-ASSEMBLY-2

FUNCTION	JOB CLASS	STANDARD HOURS/LINE					TOTAL HOURS @ 100%
NUMBER LINES SCHEDULED		1	2	3	4	5	
Oil and grease	7	0.50	1.00	1.50	2.00	2.50	2.50
A.M. inspection	3	0.75	1.50	2.25	3.00	3.75	3.75
Check conveyors	5	0.25	0.50	0.70	0.90	1.00	1.00
Running adjustment	2	4.00	8.00	12.00	16.00	20.00	20.00
Clean machines	7	0.50	1.00	1.50	2.00	2.50	2.50
Sweep	6	1.00	2.00	2.75	3.50	4.00	4.00
Collect scrap	5	0.25	0.50	0.75	1.00	1.25	1.25
P.M. inspection	3	0.50	1.00	1.50	2.00	2.50	2.50
TOTAL HOURS		7.75	15.50	22.70	30.40	37.50	37.50

This is a type of manning chart used for scheduling maintenance workers in a repetitive process plant where production schedules vary from day to day. By daily checking of the production schedule the plant engineer can plan his work, both routine and special, based on a standard size crew

the major emphasis is to keep the equipment running for a prearranged specified time, and then to completely overhaul it. In repetitive manufacture the emphasis is on keeping the equipment running at the desired speed for a scheduled shift, and then to repair only the one machine. The concept of preventive and repair maintenance changes radically.

Type of Maintenance Schedules—*1. Preventive and Repair.* Primary objective in repetitive processing is to maintain production schedules on a daily basis. Labor is generally a more costly item, and must be kept productively employed. Preventive maintenance takes on the duty of preventing breakdowns, and becomes a matter of daily inspection and adjusting the scheduled equipment.

In this situation the preventive maintenance crew becomes the repair crew also. Equipment is inspected and tested each day before production shifts start. Any necessary adjustments and modifications are made immediately. This type of work is continued during coffee breaks and lunch periods. Where any abnormal wear is noted, the machine is scheduled for repair, and all required parts are obtained.

Exact method of making the repairs varies with conditions of the company. Where there are several lines, one line may be shut down and the crew transferred. Where the company has the extra equipment, the one machine may be taken out of the production area and repaired, and another similar piece of equipment put in its place. If neither of the above two are practical, the repair work may be done on a second shift or on a week-end.

The crew required for the inspecting, adjusting, and testing is usually assigned by line or area, and consists of a grouping of crafts under a working supervisor.

2. Cleanup. Cleanup crews are generally assigned by area, and handle all the required functions of the area. Normal daily functions (sweeping, scrap collecting, etc.) are performed based on the lines or machines scheduled and running. Other regularly scheduled duties (machine cleaning, window washing, floor scrubbing, etc.) are performed based on non-scheduled lines or machines. Other standard functions (painting walls and machines, caulking windows and doors and screens, etc.) are performed on a time (seasonal) basis and adjusted to meet daily production schedules at the given season.

Setting the Budget—As we have noted above, the preventive and repair maintenance work is tied closely together in repetitive manufacture. Both are dependent on line production and should be budgeted accordingly.

The inspection and adjusting crew is set up and charged out by productive hours of operation based on the standard line speed. By so charging we again emphasize the necessity of cooperation between production and maintenance.

Maintenance has the responsibility of getting the equipment in condition to produce at the standard speed; and Production has the responsibility for obtaining the standard production from the equipment. Thus each must critically appraise the activity of the other for neither is complete alone.

Cleanup crews are charged out in the same fashion. A crew is set up based on the work to be performed, and the frequency of performance. The necessary tasks are set up on a standard performance basis, and a scheduled frequency planned. The man-hours necessary are charged out against the equipment scheduled to run based on line hours or machine hours.

By setting standards of performance for each of the required types of maintenance, and assigning crews by line hours of scheduled production, the true size of the maintenance department can be determined.

By charging the crews to productive hours and actual production the excess variances can be used by the plant engineer to check the performance of his workers in their ability to keep the equipment running at the standard speed, and the ability of the production crews to obtain the standard production in good parts. The plant engineer then knows where to expect trouble and can prepare for it.

5. In Intermittent Process Industries

MOST DIFFICULT type of industry to handle, with regard to maintenance budgets, is the intermittent process industry, commonly called the job shop. A "job shop" or "custom house" runs small orders on a no-repeat basis. These may be special orders for a few pieces covering several industries, or the fabrication of one specially built unit in a given industry.

An example of the first type would be a screw machine shop where the material, size shape, and tolerance of each order would be different. An example of the second type would be a company specializing in restaurant or lounge interiors, where the materials, operations, and end use would be the same, but the size, and shape would be different with each order.

It should be noted here that numerous companies consider themselves job shops when in fact they are repetitive process plants. Any company doing sub-contracting work for one prime manufacturer or for several manufacturers in the same industry, i.e. auto, radio-TV, electrical appliances, etc., are repetitive manufacturers and not job shops.

True intermittent process industries are set up by process, all similar types of equipment are grouped by departments. In this manner the machine operators become highly skilled on their particular type of equipment, the foremen, setup men and inspectors are skilled craftsmen.

Production control is set up by department operation to eliminate inter-departmental problems, and is on a machine loading basis. The load per machine varies considerably with season and product.

Maintenance work in an intermittent process industry is both simple and complex. Since such a type of company is normally not too large, it has two choices: either it concentrates on one or two types of operation—and hence machines—or it concentrates on one type of product—and hence one or two machines of several varieties.

In the first instance the company has a large number

MAINTENANCE REPORT

Electric Motor Inspection and Repair

No. Oper.	Description of Operation	Est. Time	Actual Time	Materials Used
1.	Inspect motor, wiring controls, make report			
2.	Remove motor from stand. Move to electric shop			
3.	Disassemble end shield. Remove armature			
4.	Test motor, brushes, commutator, coils, and windings			
5.	Clean up and regroove commutator			
6.	Rewind field coils			

This is a general purpose form for gathering information to be used in setting up a budgetary control system. Each operation is described as completely as possible, estimates are made of the time required, and then actual records are kept of the time necessary and the materials used. The material usage can be a check on the work actually performed. When sufficient information has been assembled and classified, forecasts can be made for the succeeding period. This type of information gathering will show that majority of maintenance work is of a repetitive nature

of one type of machine—but usually has only one or two of each size. In the second instance the company has only one or two of each type of machine. In either case each piece of equipment is important.

Maintenance department is generally centralized, with each craft represented. Since the equipment worked on is limited each individual becomes skilled in his particular work. All maintenance work is usually lumped into one over-all budget, and a tentative schedule set up.

As each piece of equipment is important the majority of machine repair work is non-scheduled. When production schedules allow it, a piece of equipment is shut down and the crew goes over it. There is no preventive work as such. Where the machine load is too heavy to allow for a shutdown the machines are run until safety demands that they be repaired.

Cleanup work is usually somewhat more of a scheduled type of operation. Machine cleanup is necessary to maintain the equipment in good running condition, and is performed on a fairly scheduled basis.

Basis for Establishing the Budget—To open our attack on the budget problem in an intermittent industry, it is normally necessary to resort to historical records and hysterical data. If there are substantiated records of the past several years of operations, and the schedule at present is fairly equal to past period, then these could be used as a basis for the budget.

Usually there are insufficient records, and those that do exist are not correct. The reasons for this are simple—there has never been sufficient pressure to keep factual records and therefore they have not been kept. Those that do exist are usually incomplete in that the hours of work and materials used are inaccurate. Parts have been used and work has been done with no record kept. BUT . . .

Now is the time to set up a tentative budget and to begin keeping the records that are necessary. To delay setting the budget until there are adequate records is like giving a condemned man a stay of execution—it doesn't solve anything but merely delays it. Start now—until there is pressure there will never be the adequate records.

Now to get started: Use a machine-hour system to schedule work. Each and every machine and part has a normal life depending on its use. Use an estimator, use time-study men (if any are available), use past records as they exist —use anything that will help—but get started.

Why a machine-hour basis for setting the budget? Time as such is of no value unless it designates some amount of output or machine wear. In job shop work, where activity is irregular and equipment is used as needed, the only true criterion of wear is the actual number of hours the equipment is used.

Thus it can be judged that a given piece of equipment, after its allotted hours of productive use, should be ready for a complete checkout. Knowing the time allowed it is not impossible to set up a tentative schedule—and depending on sales and the type of work brought in—get at the equipment as near the specified time as practical.

By knowing when—and using the available records to tell us what—we can have the crew and the parts ready ahead of time. Then, when the opportunity presents itself, we are ready.

Preventive maintenance, under these conditions, takes on the activities of inspection. At regular intervals the equipment is checked under load, and the various reactions noted. As soon as any irregularity is noted, prompt action is taken: to do a complete job immediately, or, if that is impossible, to correct the immediate trouble spot and schedule the equipment out of production as rapidly as practical.

The daily oiling and greasing, or the regular setups can be used as inspection periods. In some cases the "coffee break" or lunch period can be used.

Major job in an intermittent type of industry is to get started. The maintenance program may seem a little expensive at the start, but we are only correcting errors that should never have existed. As progress is made with the records and scheduled work it frequently seems impossible to ever have done without such a program. Costs slide down, production is smoother, and a pattern of repair and replacement work is noted.

When the maintenance budget and repair and overhaul schedule shows only normal human error variance the plant engineer can consider his job well done.

Solid-Materials Pipeline Goes Over the Mountain

THE FIRST pipeline ever built to transport solid materials over mountainous country has gone into operation. Running from the mines of American Gilsonite Company at Bonanza, Utah, the $2,000,000 pipeline extends 72 miles over Book Cliff Mountains to the company's new refinery at Gilsonite, Col., which is scheduled to be completed this spring.

Crushed Gilsonite ore and water will be carried in the pipeline. The ore will be converted into metallurgical coke, and gasoline.

Designed for continuous flow, the pipeline will be shut down only after all the slurry is flushed from the system. Three electric motor-driven slurry pumps are installed at the Bonanza station. Two are used normally and one is a spare. If power should fail a pump will flush the system.

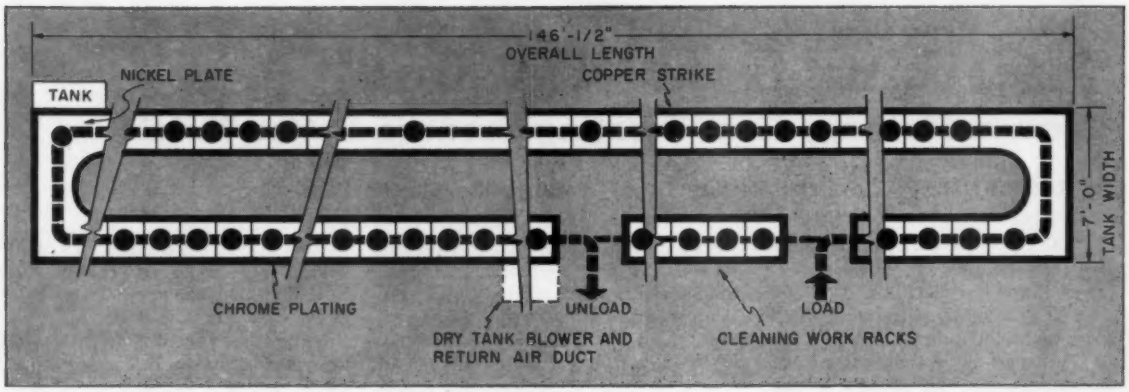


Fig. 1. More than 65 different appliance parts are electroplated in this large copper-nickel-chrome tank. Dots indicate the 34 stations where various parts go through washing, plating and rinsing operations before they are unloaded

Modernizing for More Versatility

Westinghouse Did Just That at Its East Springfield, Mass., Plant

COMPLETION OF THE air conditioner assembly line and the accompanying tooling for the cabinet and compressor marks "finish" to a rearrangement and modernization program at Westinghouse Electric Corporation's East Springfield, Mass., plant that was started nearly three years ago.

The transfer in 1953 of manufacturing facilities of the compressor, condenser and evaporator units for the company's refrigerator to the Columbus, Ohio plant provided space for a major rearrangement and modernization of existing facilities.

During this period, some operations were moved from one building to another while others were combined in a single building. New tools and thousands of feet of conveyor were included in the new layout. The net result is an efficient plant operation.

Plating Tank Handles 65 Parts

An interesting feature of this plant is the copper-nickel-chrome electroplating tank which can handle 65 different appliance parts. Plating is done at the rate of 500 sq ft per hour.

Dimensions of this electroplating tank are: 146 ft ½ in. long; 7 ft wide and 6 ft 6 in. deep. It has a capacity of 31,000 gal of processing solution. There are 33 tanks in the system: 13 are steel; 13 rubber lined; 6 Koroseal lined; and one lead lined.

Conveyors play an important part in collecting all the finished products that come off the various production lines. An automatic conveyor system gathers packaged appliances by product, stores them on an accumulator conveyor until it is full, then releases the appliances to a main trunk conveyor that moves them to the shipping warehouse.

Storing and marshalling is the key to the effectiveness of this system. Each accumulator line is made up of two or more storage conveyors. The length of each accumulator conveyor line—there are 11 in the system—provides storage on the primary conveyor for a half-hour's production of the assembly line it serves plus a length on the secondary conveyor to absorb the production until the primary conveyor is emptied. Should all accumulator conveyor lines ever become full to the half hour limit simultaneously, then any given conveyor line must hold its load until the other conveyor line loads are sequentially released to the main trunk conveyor.

The master control system operates as follows: When a primary accumulator conveyor is loaded to the half hour capacity, a timing device signals the control system and a brake belt is started in sequence. The belt runs long enough to discharge the packaged appliances to the main trunk conveyor. As soon as the primary accumulator is unloaded, the brake belt is stopped and the control system continues to sense the other accumulator lines in sequence. Loads discharged from the brake belt converge into the main trunk conveyor and continue across the bridge into the shipping warehouse.

In the warehouse, branch conveyors carry the packaged appliances to the areas where these are normally stored.

Fig. 2. Tunnel conveyor moves appliances from assembly to warehouse

Fig. 3. Plant engineering devised this bridge for cross-over, truck-loading

Something from "Nothing"

Vacuum Melting, Heat Treating Produce Better Metals

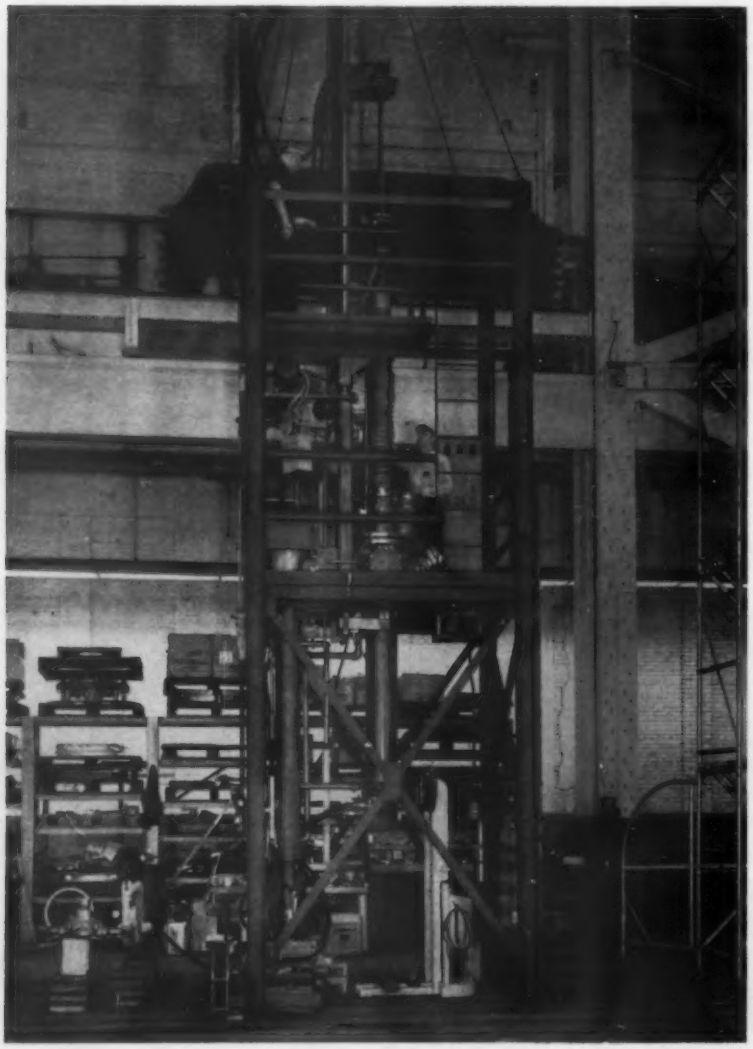
By ROGER GILER, Industrial Heating Dept., Westinghouse Electric Corp.

USE OF VACUUM in the metallurgical industry is a relatively recent development. The first commercial installation dates back only to 1938, when this process was first used in Germany for the annealing of plain carbon steel. In this country, vacuum processing appeared only a few years ago, with the widespread demand for the reactive metals such as titanium, zirconium and uranium.

Why use vacuum in metal treating? The effect obtained from operation under vacuum is twofold. First, vacuum is used as a protection in metallurgical applications which means that a protective gas is not required. Since neither air nor other gases are present in a vacuum, there is no danger of contaminating the charge. The second consideration is the fact that the vacuum is actually improving the product being treated.

The basic improvement is the removal of included gases, and possibly even the decomposition of some oxides in the case of melting, which might have a tendency to weaken the metal. Such degassing can be conducted either in the molten or solid state.

Fig. 1. Vacuum melting electric furnace cradled in the high steel framework



Quite frequently it is difficult to obtain information on the equipment used for producing a vacuum. Hence a review of vacuum equipment should be helpful here. Figure 2 indicates essentially what is meant by a vacuum and indicates the units employed in vacuum pumping. Note, that the illustration shows the range covered by various types of pumps and it is immediately apparent that one single pump cannot cover the whole range.

The mechanical pump is the oldest and most common pump. It is essentially nothing more than a compressor operating against atmospheric pressure.

Another type of pump is the Roots pump or mechanical booster pump which has a higher speed than the mechanical pump but unfortunately cannot operate continuously at the higher exhaust pressures.

Steam Ejection

Another method for producing a vacuum and which has not been considered too seriously to date, is the steam ejector. A steam ejector system for high vacuum would be built with at least six of these units in series. It is interesting to note that the speed of the steam through the nozzle of a steam ejector pump can be, under certain conditions, close to 35 times the speed of sound.

A pump with the most widespread use for high vacuum is the mercury or oil diffusion pump. The diffusion unit will operate only with a fore pressure of 1/1000 of an atmosphere or less. Therefore, it has to be used in series with a mechanical type pump. This diffusion pump is very intriguing mainly because it has no moving parts. See Figs. 3 and 4.

Another type of pump is the combination diffusion ejector pump which applies the principles of the steam ejector, using oil vapor in place of the steam, and backing up a diffusion stage.

The measurement of high vacuums is a complex subject in itself. The simplest vacuum gage is the McLeod mercury gage. One of the disadvantages of the McLeod gage is that the mercury has to be raised and

lowered continuously to obtain readings.

Electrical type gages are much easier to read since they give a continuous indication of pressure. One of the most common electrical gages is the thermocouple gage, in which a wire is heated by a constant current and the temperature of the wire is measured by means of a thermocouple. The higher the pressure, the more gas will be available at the wire for removing the heat from that wire. However, when a vacuum of the order of one millionth of an atmosphere has been reached, the variation in pressure no longer affects this gage.

Types of gages based on electron emission operate in the same fashion as the vacuum tubes where current flow is determined by the amount of gas present.

One of the first methods of melting under vacuum and probably the most widely used at this time is vacuum induction melting. A vacuum induction melting furnace is really nothing more than a standard induction melting furnace enclosed in a steel tank containing also all the molds and other necessary accessories.

Larger furnaces of this type in operation of late can handle approximately a maximum of 3000 lb of steel. However, furnaces are being developed at the present time to handle capacities up to five tons with power ratings of as much as 2500 kw. The power used will be normally 60 cycle or in the low machine frequencies.

Another type of furnace frequently used for vacuum induction melting, especially in the uranium industry, is the Micarta tube induction melting furnace. In this type of furnace the vacuum tank is made of nonmetallic material with proportionally lower electrical losses and a much smaller over-all size compared to the metallic tank type. Such a furnace may be tilt-poured (i.e. the whole furnace is tilted and the material is allowed to flow into the mold) or bottom-poured (i.e. a special type of plug releases the molten metal into a mold suspended at the bottom of the furnace).

Also used for vacuum melting is a Skull melting furnace, Fig. 5. The material can be melted either by an electric arc or an induction coil. The main feature is that the molten material is contained within a water-cooled copper crucible to prevent contamination of the material by the crucible itself. After the material has been melted, it is poured into a mold.

Another method, commonly known as vacuum pouring, was developed recently in Germany. This method is being used in several large installations in the United States and the main application is in the fabrication of large rotor forgings. In this application, steel from an open hearth or

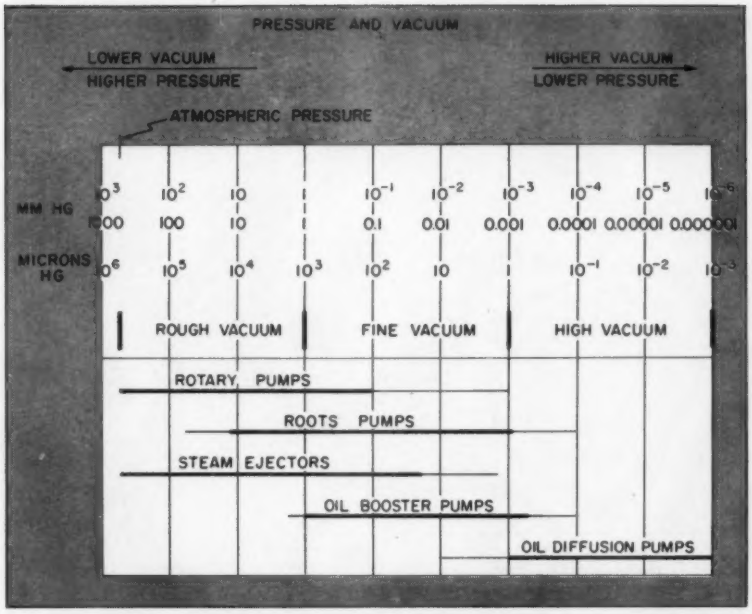


Fig. 2. Breakdown of vacuum ranges and equipment operating over these spans

Fig. 3. Housing and "umbrella" insert of a water-cooled oil diffusion pump

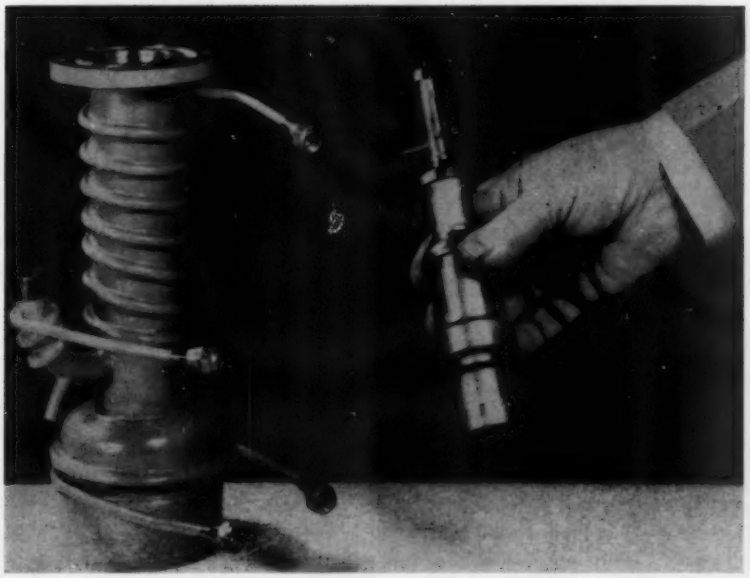
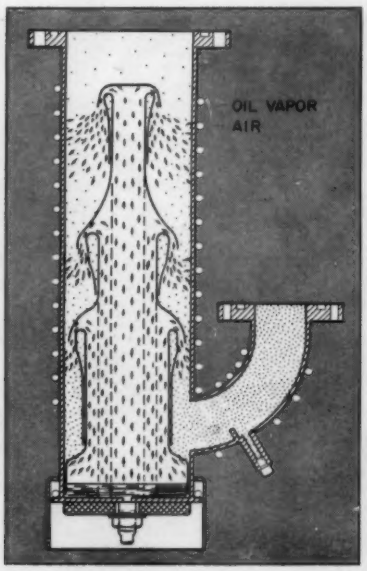


Fig. 4. Diffusion pump cross section



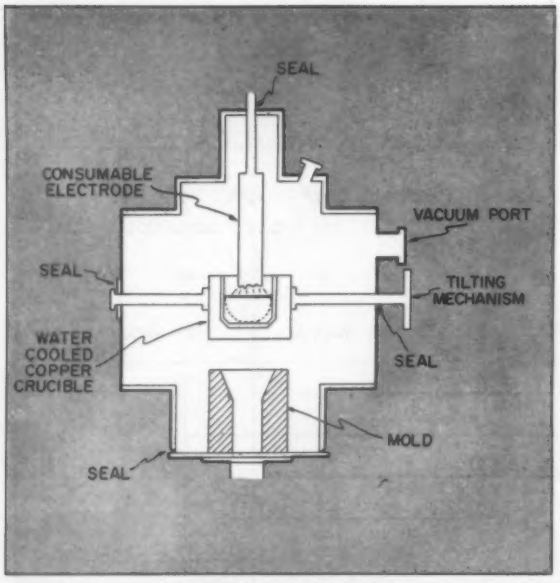


Fig. 5. Diagram of Skull melting furnace; note tilting setup

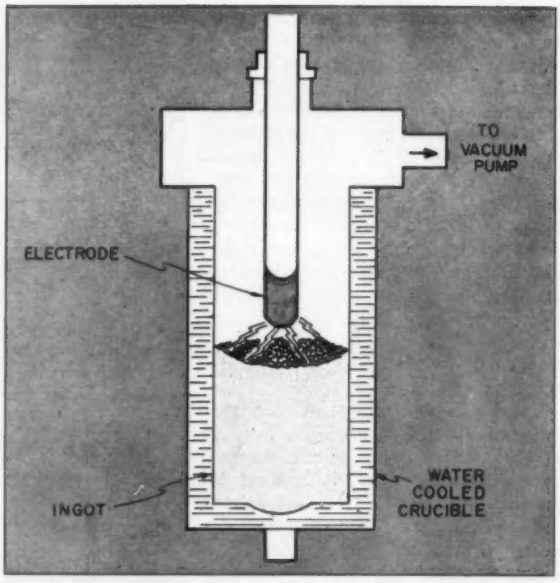


Fig. 6. Electrode is consumed in this type of melting unit

electric furnace is simply poured into another laddle or ingot mold under vacuum. Thus, the molten metal is being outgassed while it pours. No information is yet available to determine if this method will provide better quality of rotor forgings.

Vacuum arc melting is a new melting process which is spreading extremely rapidly. It was introduced first into the United States with the melting of titanium.

Vacuum arc melting furnaces are basically of two types. Type one is called a nonconsumable arc melting furnace in which melt material is fed continuously into the arc through a vibrating type feeder. The arc is struck between the electrode and material being dropped into the ingot mold. As soon as the material melts, it freezes on the wall of the water-cooled copper crucible.

Consumable Electrode

In the second type called a consumable electrode arc melting furnace, the material to be melted is actually the electrode. It melts into the crucible and forms an ingot. See Fig. 6. In this type of furnace, all the power is generated just to change one electrode into a larger ingot of the same shape. There is a good reason for doing this, refining of the metal.

Some of these furnaces require great flexibility. For example, a typical furnace for uranium and other hush-hush alloys would have a combination of both consumable and nonconsumable electrodes. In general, the control panels are remotely located because of danger of explosion associated with these furnaces.

An explosion might occur if the arc from the electrode leaves the ingot and strikes the water-cooled copper wall and the water comes into the furnace and reacts with the molten material. Proper control of the arc makes this danger negligible.

In addition to removing gases from the molten metal, the furnace shown in Fig. 1 has another advantage which is the very rapid freezing of the molten material preventing the metallurgical phenomenon known as segregation in which various constituents separate within the ingot.

Generator Forging Ingots

One of the problems being very seriously investigated today is the vacuum arc melting pertaining to the forgings to be used for rotating equipment where better ingots are badly needed. It is felt that controlling the cooling rate in a vacuum arc melting furnace can solve the problems which have been blamed for the failure of some large generators.

From the electrical standpoint, a vacuum arc melting furnace is quite simple; it utilizes a d-c arc. Power is obtained from standard welding rectifiers which are connected in parallel and produce heavy currents up to 30,000 amp. The normal voltage of the arc under vacuum, which is quite difficult to control, varies between 20 and 40 v.

The earliest vacuum furnaces were nothing more than standard box furnaces, into which a retort was placed. In a furnace of this type, the work had to be placed in a position inside the retort, not always an easy thing to do.

A major disadvantage of the standard box furnace is the fact that at high temperature the retort softens and tends to collapse under the action of atmospheric pressure. Under those conditions a double-pumped hot retort furnace is used. A high vacuum is maintained inside the retort and a so-called rough vacuum is held between the furnace retort and the furnace shell proper. The vacuum maintained on the brickwork cannot be as fine as the one that would be maintained within a clean chamber and this accounts for the two pumping systems.

If we compare heat transfer in air and vacuum, we will find that when heating something in air, the heat is transferred both by radiation and by convection of the air. On the other hand, in vacuum, the heat transfer can be by radiation only. Transfer by radiation is essentially the same method of transfer as for light, and we know that if we interpose mirrors in the path of light, the light will be reflected.

Radiation Shields

This philosophy can be applied in vacuum furnace design where radiation shields are interposed between the heat source and the vacuum retort, and in this fashion these shields can act as reflectors.

A fan can be included with this type of vacuum furnace. The purpose of the air moving equipment is to speed the process of cooling.

An inert gas such as argon or helium is introduced into the furnace and the fan recirculates that gas between the outer radiation shield and the water-cooled shell and back over the work to provide the fastest cooling method possible in a vacuum furnace.

A large furnace using the radiation principle has now been built and can handle a charge of up to 10,000 lb of titanium. Considering that the price of the finished product is close to $20 a pound, this means that a single load will have a value of $200,000 which is more than the value of the complete furnace installation. Figure 9 shows the operating principle of the Westinghouse "Kold-Retort" vacuum furnace.

The basic applications of a vacuum heat treating furnace are essentially degassing, annealing, brazing, and sintering. In a degassing furnace which could be any of the furnaces described, the material is heated under vacuum. At high temperature some undesirable gasses present in it will evolve.

In the annealing treatment, the material is heated in order to soften it. This annealing is done under vacuum since vacuum will keep the part brighter than a protective atmosphere. Quite frequently, mainly with titanium, the process of degassing and annealing is combined into a single heat treating operation.

It has been determined by the Government on aircraft work that brazing conducted under vacuum brings about much more satisfactory products than the one conducted in a protective atmosphere. To date, no explanation has been found for that phenomenon, but the results are beginning to be increasingly helpful in industrial production.

The main reason for sintering under vacuum is the fact that the organic binder used in the powder to be sintered can be removed by the vacuum while at the same time the vacuum provides an adequate protection to the parts.

If we now measure the rapid growth of the vacuum metallurgy industry in the past five years and extend this in the future we can see that very soon vacuum melted and processed metals are going to take a more and more important place in America.

Fig. 7. Large cylindrical object is a mold of the furnace in the lead illustration

Fig. 8. Furnace electrode drive gears

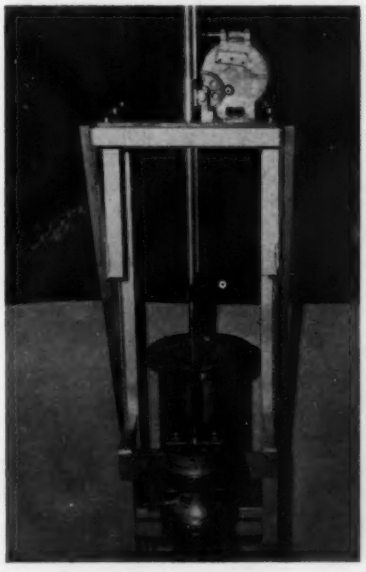
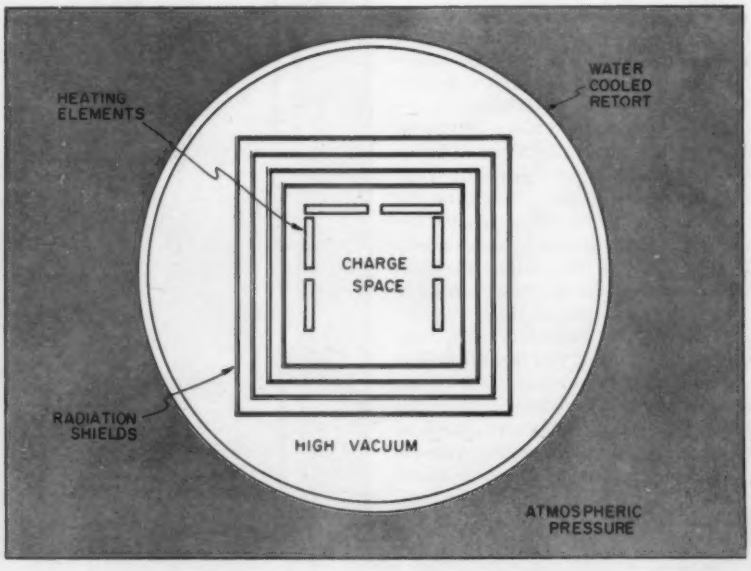


Fig. 9. Method of using the reflection principle in a "Kold Retort" furnace



Electrical Air-Break Contactors

Characteristics Applicable to Industrial Operations

By S. R. DURAND, Engineer, Pacific Region and,
THAD BELLINGER, Engineer, Control Dept., both of Allis-Chalmers Mfg. Co.

RELIABILITY OF POWER supplied to an industrial distribution system and of the electrical equipment connected to the system is of great importance in many industries. Where precise load coordination is necessary for system stability, there are some designs of high voltage air-break contactors which can be regulated for specific operating characteristics.

These characteristics can be obtained by adjusting the contactor magnets and operating coil circuits to provide specific values of drop-out voltage and drop-out time. Such changes in operating characteristics can be valuable in helping a motor to ride through system disturbances or, if disconnected, to be more safely and quickly reconnected when power is restored.

When ground fault current is limited in a system to within the interrupting capacity of an air-break contactor, high speed ground fault relaying can be used for quick tripping of a contactor so as to minimize arcing damage at the fault.

Modify Contactors to Fit Needs

High voltage air-break contactors, designed to stay closed unless system voltage decays to a very low value and to open only after a few tenths of a second time delay, provide for fewer outages of important motors during momentary system disturbances.

Large motors, from about 150 hp to 1500 hp at 2300 v and to 2500 hp at 4000 or 4800 v, are generally connected to industrial power systems through contactors. These contactors generally have operating characteristics which are not adjustable and which may not be the most favorable for maximum system stability.

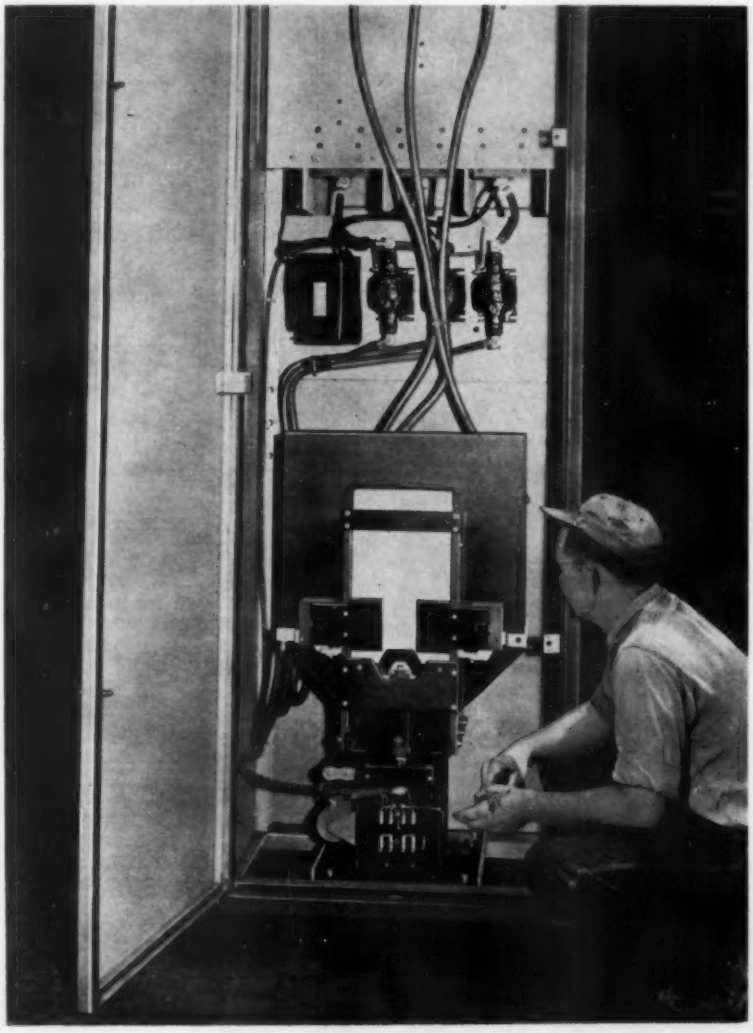
However, if contactors supplying critical motor loads can be adjusted to improve their operating characteristics, consideration should be given to taking advantage of these modifications so as to obtain better over-all performance of system and equipment.

Contactors, unlike circuit breakers, are not latched in mechanically after being closed. They are dependent upon a sustained voltage supply from the industrial distribution system for energizing the magnet coils during motor operation.

Contactors operated by a-c magnets have critical drop-out points slightly below 85 per cent of rated voltage, which is the NEMA minimum pick-up value. A voltage dip below this value for only two or three cycles, which is normal drop-out time, may cause contactors to drop out and disconnect their motors from the system.

One of the characteristics can be changed in high voltage air-break contactors by adjusting the magnet and the magnet coil circuit to obtain lower

Fig. 1. Cubicle includes high voltage air-break contactor and control wiring



drop-out values. Contactor coils operated from rectified alternating current can be designed to maintain the contactors closed until voltages as low as 35 per cent of normal have been reached.

Another characteristic that can be provided pertains to the hold-in time after a voltage failure or a voltage dip to below 35 per cent of normal. By using d-c operated contactors, the drop-out time can be several times greater than that of the a-c operated contactors.

During this extended drop-out time, many severe faults or switching surges causing voltage dips in industrial distribution systems or in power supply systems would be cleared by circuit breaker action. Voltage would be restored before contactors of this type would drop out and disconnect a critical motor from the system.

Other advantages of the d-c operated contactors are: 1. Contactors pick up and close with less impact and less current. 2. Contactor magnets can have smaller masses. 3. The coil magnetic circuits are quieter during operation and maintain a more positive contact pressure. 4. The contactors drop out more positively. 5. Contactors require less maintenance. 6. Contactors have a sharper pick-up point, which occurs at lower voltage.

The high voltage air-break contactors used for starting and stopping the a-c motors are rated 400 amp at a maximum of 5000 v. The contactors have interrupting capacity of 50,000 kva. They can be applied to squirrel-cage motors having maximum ratings of 1500 hp at 2500 v and 2500 hp at 4800 v. The contactors are operated from rectified a-c through a two-section, center-tapped rectifier. The rectifier, economizing resistor, and auxiliary switch are all mounted and wired on the contactors, providing a complete self-contained operating unit.

The contactor operating circuit shown in Fig. 2 provides for simple and flexible control circuits for operation from standard a-c control voltages. This circuit provides a means for adjusting the drop-out voltage point and the drop-out time. Additional adjustments are provided by controlling the sealed magnet air gap.

Referring to Fig. 2, one-half of the rectifier stack is in series with the contactor magnet coil M and the other half is in parallel with the coil. During one-half cycle of the a-c wave, current flows through the series branch of the rectifier and directly through the coil. During the other half cycle, while current is blocked by the series branch of the rectifier, an inductive current from the coil flows through the parallel branch, thus

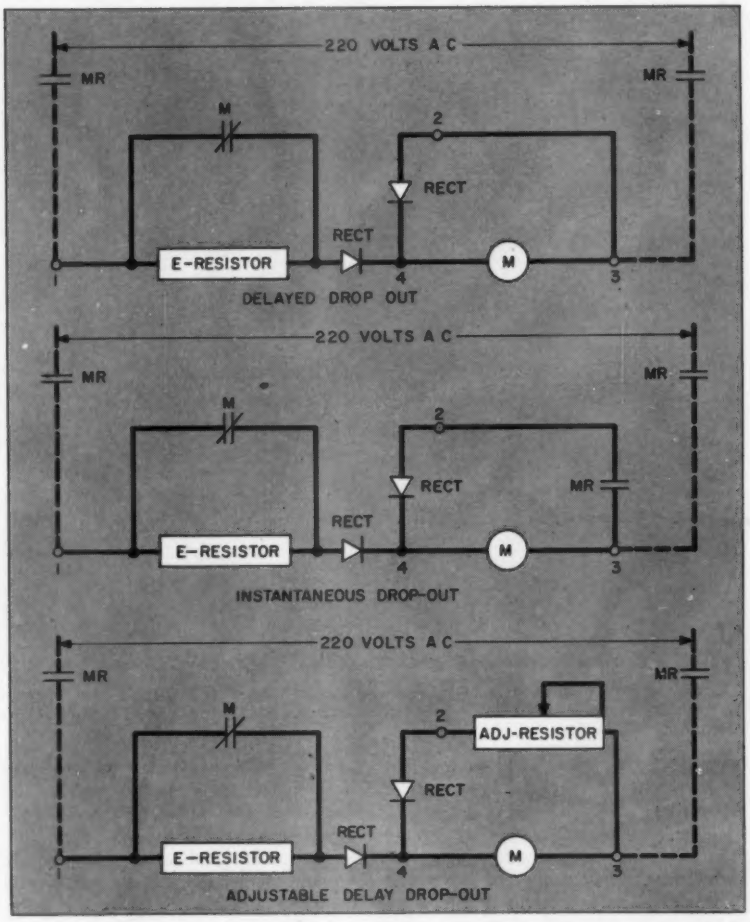


Fig. 2. Operating circuits for control of a high voltage air-break contactor

maintaining a unidirectional current and magnetic force in the magnet.

The magnetic characteristic obtained by rectified direct current in this circuit and by design of the air gap in the magnet provides controlled drop-out voltage and drop-out time after voltage failure.

Use of Time-Delay Relays

For critical plant process operations, time-delay undervoltage relays are used in the contactor control circuits. These relays are often set to maintain a contact closed across the start pushbutton for about 2 to 6 sec after voltage failure. Thus, they function effectively as automatic reclosing devices because the contactor will reclose if power is restored within the time setting of the relay.

In the circuit of Fig. 3, illustration "a" this undervoltage relay is designated UV. A flux decay type of relay equipped with time-delay opening contacts is used. The time setting is adjustable by varying the tension of the relay spring and relay air gap. An air-break contactor with this circuit will automatically reclose after a voltage failure if voltage is restored to or greater than the pick-up voltage of the contactor before the flux decay relay contact opens.

In planning this type of time-delay reclosing control for extensive use throughout a refinery, chemical plant or industrial plant, a careful study of the power system is essential. After a severe fault in the system it may not be possible to automatically reaccelerate a large number of motors simultaneously because of excessive voltage drop due to heavy restarting motor currents.

Thus, it may be necessary to select only the most critical motors of process units and equip only their contactors with time-delay undervoltage restarting relays. However, when designing a new system for high reliability, adequate capacity to enable all motor contactors to have time-delay undervoltage devices can be justified if cost of loss of time or product and product quality is excessive.

Induction motors decelerate rapidly after loss of power. The further they

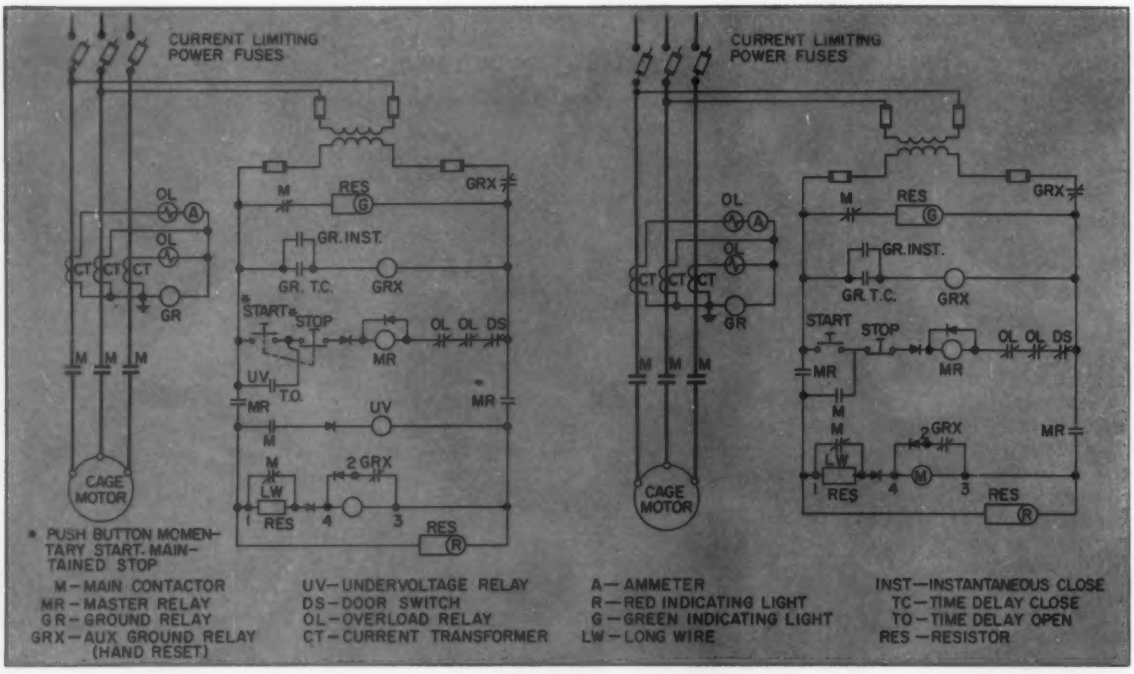


Fig. 3. Schematics for line-starting cage motor controller. Circuit "a" permits delayed drop-out and time-delay undervoltage starting. Circuit "b" has provisions for instantaneous shutdown on voltage loss and also for manual restarting

slip, the more current will be required to reaccelerate them back to normal speed.

The rate of voltage decay at the terminals of large induction motors after they are disconnected can result in residual voltages which can be as much as 25 per cent of normal after one second. If a contactor is reclosed in this time and if the residual voltage in the windings happens to be about 180 deg out of phase with the system voltage, stresses in the windings above design tolerances may occur.

Residual Voltage Solutions

Because a voltage dip could last only about one-tenth second and since the pick-up time of a contactor is only about an additional one-tenth second, an induction motor can be automatically reconnected long before the residual voltage has had time to decay to below a safe value for a standard motor design. Therefore time-delay undervoltage reclosing does not provide the optimum protection unless controlled drop-out of the contactors is employed. A value below 25 per cent residual voltage is considered to be safe for reconnecting a motor to a system.

Two solutions are possible to overcome this danger. One is to delay contactor reclosing for about a second or two by means of another relay which will not permit reclosing until the voltage has decayed to a safe value. For accurate protection, this residual voltage relay would have to be connected through a potential transformer to the motorside of the contactor terminals.

The other solution is to lower the voltage at which the contactor will drop out and also to delay the drop-out time after loss of voltage as previously described. This latter solution is simpler and better for the following reasons:

1. By adjusting the contactor magnet circuit to reduce the drop-out voltage to below 35 per cent of normal, the residual voltage at the terminals of the motor when it is disconnected will be lower and will decay to a safe value more quickly.

2. By delaying contactor drop-out, for example, until after four-tenths of a second, in which time the motor remains connected to the system while it is at less than 35 per cent voltage, the voltage at the motor terminals is dragged down to a safe value. The motor, while still connected, can regenerate rotor flux energy into the system.

Most important in this consideration is that many faults would be cleared within four-tenths of a second and the voltage would recover before the contactor would have disconnected the motor from the system.

The hazard of reconnecting a large motor with a high residual voltage 180 deg out of phase is overcome if its contactor has not dropped out during a very short system disturbance.

Furthermore, by not having it disconnected from the system, there is no time loss in automatic reclosing of the contactor, so the motor will accelerate to normal speed more quickly and with less current.

These problems are usually only of concern with large induction motors. Small low voltage induction motors have faster rates of residual voltage decay and can generally withstand greater stresses if reconnected out of phase with the system.

Synchronous motors for safe operation under these conditions may require additional protective devices because they may not be designed to reaccelerate their connected equipment without partial or full reduction in loading.

Oscillograms of Figs. 4 and 5 show the closing and drop-out characteristics of a high voltage air-break contactor which is suitable for the protective operations. In Fig. 4 the closing time of a previously discussed d-c operated contactor is seven cycles, or just over one-tenth second until the main contacts touch. In making this oscillogram, a d-c potential was applied to the main contacts, since it was desired to determine only the contact make and break timing. The contact opening time upon disconnecting power is only three cycles, or five-hundredths of a second.

A contact MR of the auxiliary control relay MR, as indicated in Fig. 2b, was used to open up the parallel

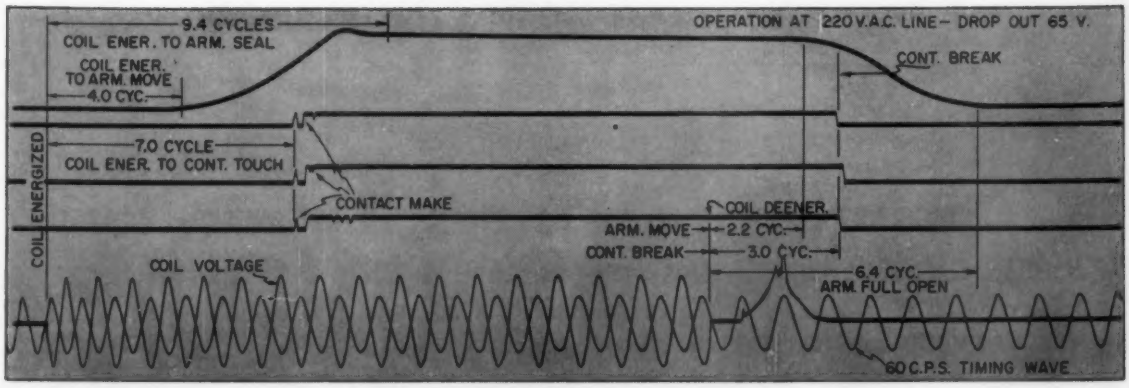


Fig. 4. Oscillogram of a d-c operated contactor. Contacts touch in seven cycles and the opening time covers three cycles

branch of the rectifier across the contactor magnet coil M when making the oscillograph of Fig. 4. This contact may be used when time-delay drop-out characteristics are not required.

Figure 5 is the oscillogram for a contactor connected for delayed drop-out time. The pick-up time of the contactor is about the same as that of Fig. 4. However, the drop-out time after disconnecting power has been delayed to 26 cycles, or slightly over four-tenths of a second. This delayed drop-out characteristic is accomplished by maintaining the discharge rectifier circuit, shown in Fig. 2 (top). Stored energy in the coil is thus dissipated slowly while current decays through this closed branch of the rectifier circuit.

During the delayed time the magnet remains closed; contact pressure is maintained on the contacts as shown by no movement of the top oscillograph trace record of contactor armature travel. After starting to open, the contacts part at normal speed and the opening time is the same as before to the full open position.

Air-break contactors and large motors are protected from severe faults within them or on the cables interconnecting them by current-limiting fuses, as shown in Fig. 3. The motors are protected further for overloads by current transformers and overload relays, designated OL on the diagram. The usual practice is to use two overload relays connected to current transformers in the outer two phases.

When ground fault current is limited by resistance to be within the interrupting capacity of an air-break contactor, a third current transformer and a residual ground current relay GR can be added, as shown in the diagrams of Fig. 3.

Connecting Auxiliary Relay

Since most faults that occur on motor circuits are phase-to-ground failures, it is desirable to connect the auxiliary relay GRX of the ground relay to not only open the contactor control circuit but also to open the paralleled circulating current branch circuit of the magnet rectifier. This will cause a contactor controlled for time-delay drop-out to open quickly when a ground relay operation takes place.

On a ground fault occurrence, it is a good practice for the auxiliary relay GRX to be a lockout-type relay. Fast opening of the contactor will minimize arcing damage at the fault and lockout operation will indicate that a ground should be investigated before reclosing the contactor.

The complete motor controller schematics shown in Fig. 3 are so arranged that all of the sealing and de-energizing of the controllers becomes a direct function of the high voltage air-break contactors. In order to obtain this feature, a master relay MR was required which would have a drop-out voltage value lower than that for the line contactor.

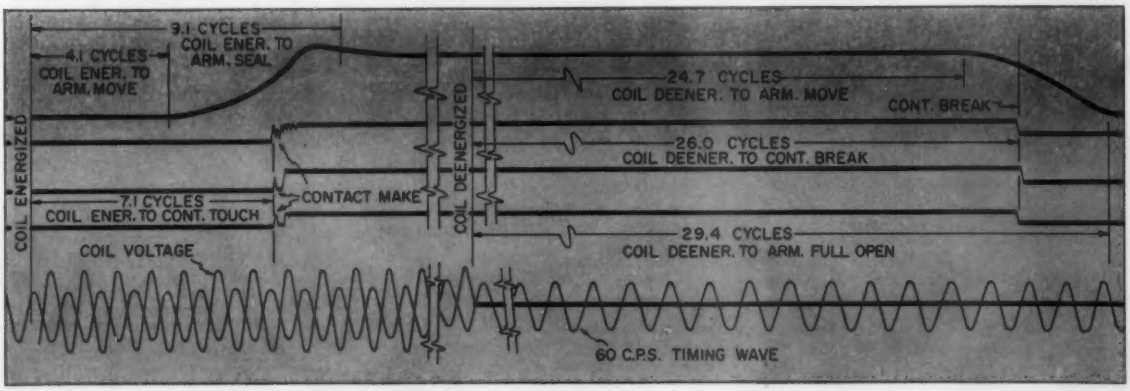
This was accomplished by using a standard a-c control relay and employing a similar rectifier circuit as that used for the high voltage air-break contactor. The master relay operating circuit was so arranged that the relay drop-out point would be 10 per cent lower than the drop-out point of the contactor.

In Fig. 3, the time-delay undervoltage relay UV is also d-c operated and arranged to have a lower drop-out than the contactor M. The undervoltage time delay does not commence until the high voltage air-break contactor has opened.

This function is provided through the auxiliary interlock of contactor M

(Continued on page 258)

Fig. 5. Oscillogram shows delayed drop-out of d-c operated contactor, occurring 26 cycles after power disconnection



IX. Compressors, Filters, Lubricators

What to Check for Efficient Operation of This Equipment

By H. L. STEWART and J. M. MORITZ, Logansport Machine Co., Inc.

USUALLY WHEN WE speak of a pneumatic circuit, little thought is given to what goes on beyond the confines of that circuit. Not much consideration is given to the source of power—the compressor—as to whether it is large enough to deliver the desired amount of compressed air or to make all of the circuits function as the requirements demand.

Too often plants keep adding machines requiring compressed air without enlarging their compressed air capacity. This results in the air pressure dropping below a satisfactory operating point when all of the machines are turned on at the beginning of a work shift. This can often cause machine failures and damaged workpieces. The plant engineer should keep a close watch to see that this does not happen and advise management, in time, of the need for added compressor capacity.

The function of the air compressor is to take air in at atmospheric pressure and compress it to a higher discharge pressure. Most compressors used in industrial plants furnish air at pressures between 80 and 150 psi. There are various types of compressors such as single stage, two stage and multi-stage; reciprocating, rotary and centrifugal. See Fig. 1.

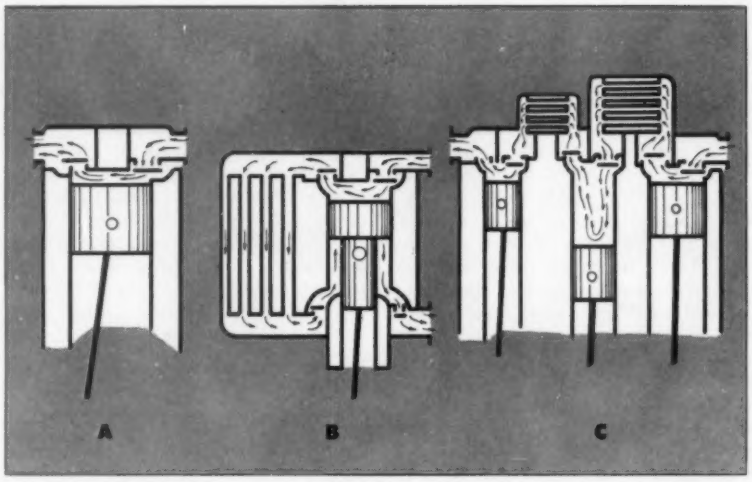


Fig. 1. Types of compressors shown: A. Single-acting compressor; B. Double-acting, two-stage compressor with intercooler; C. Single-acting, multi-stage compressor

Compressors may be driven by electric motors, gasoline or diesel engines or steam power. Most of those in industrial plants are driven by electric motors.

Air compressors should be located so that they are readily accessible for servicing. Where large compressors are used, it is well to place them in a separate room or enclosure, but there should be sufficient space all around the compressor so that the maintenance personnel has plenty of room to work when repairs are required.

Compressors in large industrial applications should be mounted on a firm concrete foundation whose depth is well below the frost line. If a good subsoil is not available, then it may be necessary to provide a concrete mat below the foundation. In very bad subsoil areas, it may be necessary to drive piling before laying the concrete mat. In every instance, the compressor must be suitably supported.

It is well to provide a means for keeping unauthorized personnel out of the compressor room.

The air intake line of the compressor should be piped to the outside of the building and should gather the coolest, cleanest air possible. The intake should be kept away from ash piles, coal docks, saw dust piles, chemical fumes and deposits, and any other materials which might contaminate the air. An air intake filter is recommended where ever a dusty condition occurs.

A good example of this is the installation where a customer was having considerable failure with air cylinders due to certain synthetic parts swelling. At first the condition was blamed on the type of lubricating oil being used, but a change in oil made no difference. Finally, it was discovered that the intake of the compressor was located near the exhaust of chemical fumes. These fumes were being drawn into the air system and the chemical reaction on the synthetic material caused the swelling action.

In another instance, we found that a foundry was having considerable trouble with their air circuits. The action of the circuit components would slow down and become sluggish a short time after they were installed. In disassembling the filter, it was found that it was completely full of fine sand—brought into the system through the intake of the compressor.

Air intake pipes, when placed above the floor, should be made of steel or sheet metal. If they are placed under the floor, the use of glazed vitrified pipe works very well. When concrete ducts are used, they should be completely sound to eliminate the possibility of dust being drawn into the compressor. A good concrete paint will act as a protection.

The intake line to the compressor should be thoroughly cleaned before the compressor is placed in operation to make certain that no foreign matter is present.

Aftercoolers are often connected to the air discharge line from the compressor in order to cool the air after

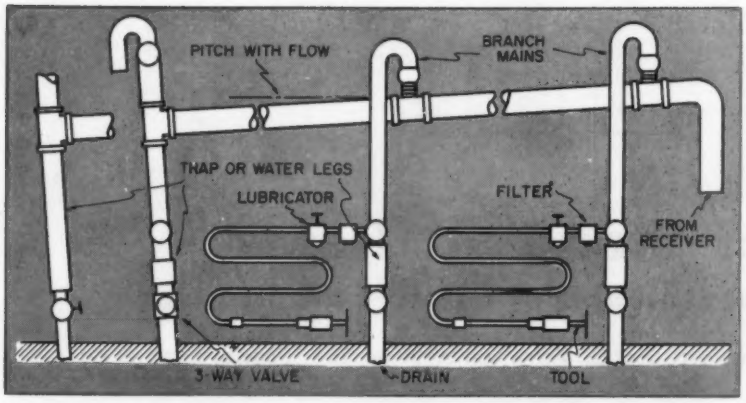


Fig. 2. Typical arrangement of a pneumatic circuit indicates recommended locations for filters, lubricators and traps. Pitch mains in direction of air flow

it leaves the compressor. These units are effective in removing moisture from the compressed air system. The shell and tube type aftercoolers are normally used. They may be either of the single or double stage types.

After the air leaves the aftercooler, it is then piped to the receiver or storage tank. When no aftercooler is used, the discharge line should be piped to the receiver with as short a line as possible. This line should be free of any pockets which might accumulate oil.

Maintenance is usually not a big item on air compressors. If the compressor is properly installed, has reasonably clean intake air and is serviced at regular intervals, the cost of maintenance is small. When replacements, such as belts or packings are required, use the best that are available. When leather belting is used, it may be necessary to use a small amount of belt dressing to prevent slippage. If grease is present on the pulley and should get on the belt, be sure to remove it by cleaning with a non-inflammable solvent.

When it is necessary to replace the packing in the stuffing box, a similar method to that employed in repacking cylinders is used. The packing should be drawn up only very lightly, just enough to stop any leakage.

The compressor should be lubricated periodically as recommended by the manufacturer. Oil in the crankcase should be changed at regular intervals, and the oil level should always be kept at the full mark.

Use of traps and separators in a pneumatic layout is very essential for removing water. Traps should be placed at low spots in the pneumatic layout in order to pick up as much moisture as possible. Several different methods can be used to trap the moisture as it moves through the system.

The question often arises as to the effect of moisture in a pneumatic system. There are a number of reasons why moisture should be removed:

1. Moisture is a trouble-maker, especially where the pneumatic system is subjected to extremely cold weather. For example, on outdoor unloading mechanisms, the air in the piping system is transferred from the warm building atmosphere to an extremely cold one outside. Condensation or moisture will gather in the low spots in the circuit and cause ice to form—shutting off the air flow and sometimes rupturing the pipe line. Moisture may also cause the valves and cylinders to become inoperative.

2. Moisture will dilute lubrication to a point that it will not do a suitable job. This will cause wear and corrosion in the components.

3. Moisture often causes the components of a circuit to have a sluggish action. It will foul up small pilot lines and will settle in valves and cylinders.

4. Moisture will cause a rusting condition in steel lines and the particles of rust will get into the system and cause considerable trouble to the components if filters are not present.

5. An excessive amount of water in the pneumatic lines may also cause water hammer. This not only is annoying as far as the noise is concerned but it may also damage the lines.

6. Excessive moisture is also quite objectionable to machine operators as the exhausting air from a valve often sprays a mixture of water and lubricant on the machine and operator. If there is a muffler on the control valve, it will often become water-logged and cause trouble in the system.

A filter should be installed at the entrance of each air circuit, Fig. 2. These filters keep scale, rust, and other foreign matter out of the circuit. Often a machine containing an air circuit will be shipped into a plant without a filter or a lubricator. In this instance, the installers or maintenance personnel should immediately notify management and recommend that filters and lubricators be installed before the machine is placed in operation.

The ideal filter would be one which would remove all of the moisture and foreign matter, yet allow the compressed air to flow without any restrictions. In plants where there is an excessive amount of dirt and moisture in the air lines, filters need servicing much more often than in plants where they have a well laid out air system with aftercoolers, water traps, air intake filters on the compressor and an even temperature in the building.

There have been installations where the filters have become clogged and inoperative in less than a week of operation. A situation of this type is extremely difficult to cope with. One solution is to use filters with capacity far in excess of what would be normally required. One way to detect the necessity for cleaning an air filter is that the components of the system will become sluggish in action.

There are different types of filters

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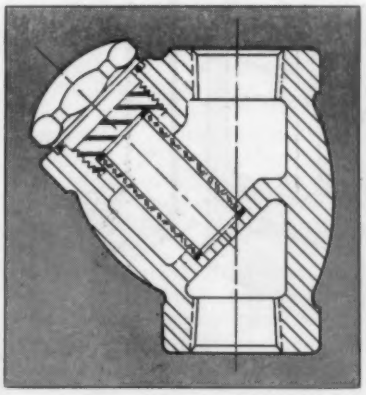


Fig. 3. The filter element, shown here, will require very little maintenance

Fig. 4. Lubricators should be easily accessible for visual check and refilling

Installation of Standard Items

Way of Doing Instrumentation Work With Less Drawings

By CHESTER S. BEARD, Chief Engineer, Control Valve and Actuator Div., General Controls Co.

WHEN IT IS SAID THAT the engineering of instrumentation starts after the instruments and control systems have been selected, there will probably be an uproar from many sides. It must be granted that engineering knowledge is necessary from the inception of the project when most discussions concern process, to the vital and practical considerations of installation and construction.

Many of you will remember when a flow meter was literally tacked on a post or wall and static leads draped over equipment to an orifice meter run; when a pyrometer was hung as close as possible to a heater or foundry pot; and the leads to a thermocouple were stuck through a hole to reach the location at which temperature was to be measured. Admittedly, these approaches were uneconomical and only possible when a few instruments were being used.

Increase in the number of instruments in a plant and the concentration of intelligence at a central point make it imperative that hook-ups for similar instruments be uniform and that long leads from transmitters, potentiometers or analysis units be grouped and routed directly and safely to control centers.

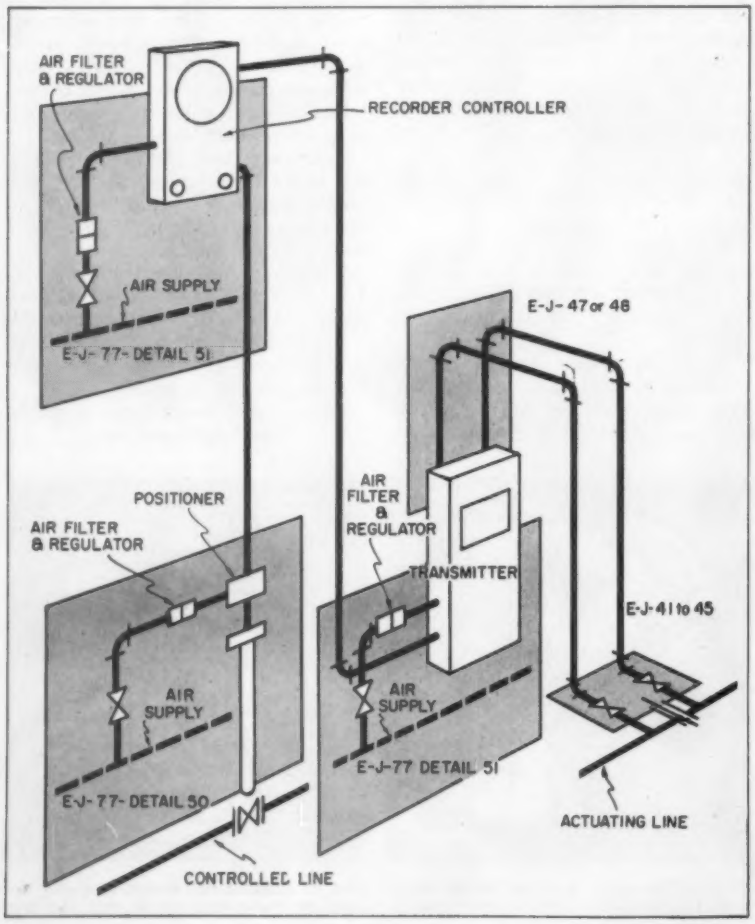
Advent of the use of transmitters to a control board has fortunately simplified the piping of the board itself. One copper tube per reading, simply connected to the receiver, has replaced one or more pipe leads with innumerable valves and fittings. Use of master air regulators to furnish instrument air to a header for supply to all controllers on a board, or section of a board, has decreased the congestion caused by individual filters and regulators at each controller.

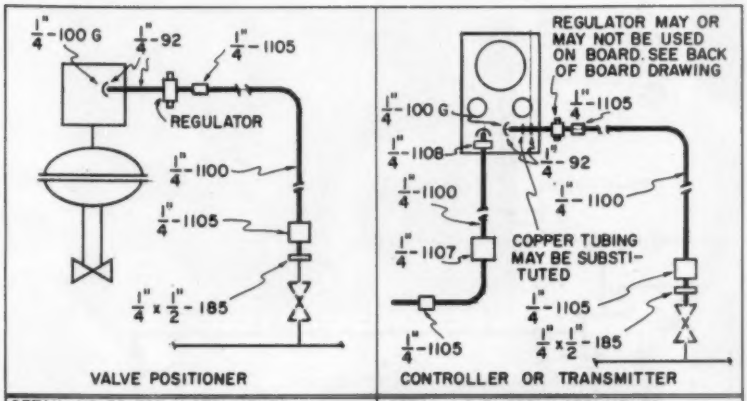
In most cases, fabrication and piping of more complicated boards have become the problem of the manufacturer. In any case, the piping and wiring leads from the instruments on the boards are run to terminal strips. The accumulated leads from field instruments are brought to this one location where they may be checked out and connected for operating the correct panel unit.

Use of the transmission system has not eliminated the necessity for careful installation of the field measurement instrument which is the transmitter; in fact it has emphasized this requirement. The transmission system, whether pneumatic or electric, loses its value if the measuring element does not give a faithful reproduction of what is going on inside a line or piece of equipment.

Installation of the transmitters and other field-mounted instruments is a phase of plant operations that can be simplified by standardization. It means using similar or identical thermal well fittings, by-pass pipe sets for meters, static connections, and many other groups of fittings which individually

Fig. 1. The diagram shows relationship of units in an instrumentation group. For connection details drawing reference numbers appear in the shaded portions





DETAIL NO. 50 FOR INSTRUMENTS

DETAIL NO. 51 FOR INSTRUMENTS

DETAIL NO. 50	DETAIL NO. 51	QUANT.	ITEM NO.	DESCRIPTION
VARIES			1100	¼" O.D. 20 B.W.G. SOFT COPPER TUBING
2	2		92	¼" x 1½" SCHED. 80 SMLS. STL. PIPE NIPPLE GALV. T.B.E.
1	1		100 G	¼" 150 lb M.I. SCRD. 90° ELL., GALV.
1	1		185	½" x ¼" F.S. HEX. BUSHING
2	3		1105	¼" TUBE x ¼" N.P.T. MALE BRASS CONN. WITH NUT
	1		1107	¼" TUBE x ¼" TUBE BRASS TUBE UNION WITH NUTS
	1		1108	¼" TUBE x ¼" N.P.T. MALE BRASS 90° ELBOW

Fig. 2. On the left is a detail drawing for piping air to a valve positioner; on the right is a guide for supplying air to a system controller or transmitter

may seem simple. When the use of tens or hundreds of each type of item occurs in one location, reproduction of a standard method will be rewarding.

Standardized installations may be depicted with a minimum of drawings using a method similar to the one which will be described. First, each control recording or recording-controlling system must be shown diagrammatically. For example, Fig. 1 illustrates a system including a flow transmitter, receiver-recorder controller and a control valve with a valve positioner.

In this system, two static leads run from the differential-creating device to the transmitter. A transmitter lead, copper tubing, goes to the receiver which in all likelihood is mounted on a board. The controller lead runs to the positioner at the control valve. In this control system, instrument air must be supplied to each unit. Installation of the control valve in the controlled line has been noted on piping drawings.

Reference to details mentioned in one of the shaded rectangles will show how to pipe or wire that location. Consider steam control, if you will. Detail No. 51, Fig. 2 is a standard guide for supplying instrument air to a transmitter or controller. Supply of instrument air to a valve positioner is shown in detail drawing No. 50, Fig. 2. The method of piping a manometer manifold for steam service is shown on drawing E-J-47 as detail No. 10 which has been reproduced in Fig. 3.

Fittings are listed on the detail drawings for the pressure ratings involved on the job. This whole system is based upon an item list in which each separate pipe or wiring fitting or bracket is assigned a number. Beside this, a place is provided on the detail drawing for listing the numbers of all instruments using the detail.

Upon completion of the design, the number of each item required to install the details included on the drawing, are totaled and noted under "Quantity." A master sheet or "horse blanket" lists all items across the top of the sheet, and detail drawing numbers down the left hand side. Numbers of items required for each detail drawing are tabulated and a recapitulation taken at the bottom of the sheet.

It will be found that certain installations do not fit into a pattern and that a special piping drawing (in most cases, 8½ by 11 in.) will be required. These "specials" are included in the recapitulation.

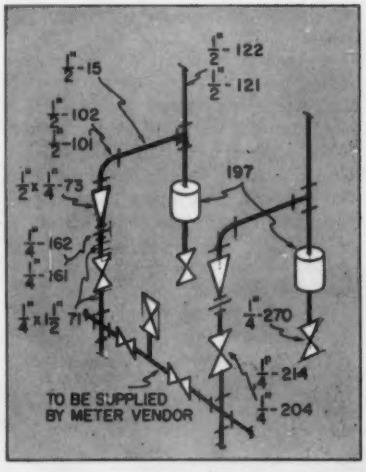
A preliminary order for fittings is advisable. This order, having been based upon a look at the crystal ball, is supplemented as required to supply the totals as determined from the details.

At an early period in the design stage of the job, a piping and instrument diagram is developed. This shows functionally where the instruments are located. It is then necessary to physically locate the instruments such as indicators, recorders, and transmitters. The control valves, thermal wells, meter runs and other primary devices already have been located on the piping drawings. Layout of instruments is done on an "instrument points and lines layout." See Fig. 4. Major equipment such as heat exchangers, columns, walls and supports are traced from an equipment location or piping drawing in order to locate the instruments and primary elements.

Only a short portion of each line which includes a meter run, valve or tap is shown on the instrument points and lines drawing. Identification of the line by number of function is necessary. These short sections of line may be traced directly from the piping drawing. The instrument and leads to the line are located as accurately as seems necessary, using simple outlines of the instruments which can be easily recognized.

An experienced pipe-fitter will take liberties in locating leads to instruments. The drawing must, however, locate the leads to a control board in such a way that troughs or brackets may be installed. This requires consideration of the location of walls, beams and possible supporting structures. The accumulation of lead lines as shown by the numbers in the small circles within the tubing line must be considered for economical bracketing. Prefabricated troughs and carrier

Fig. 3. Detail 10, drawing E-J-47 for piping manometer for steam service



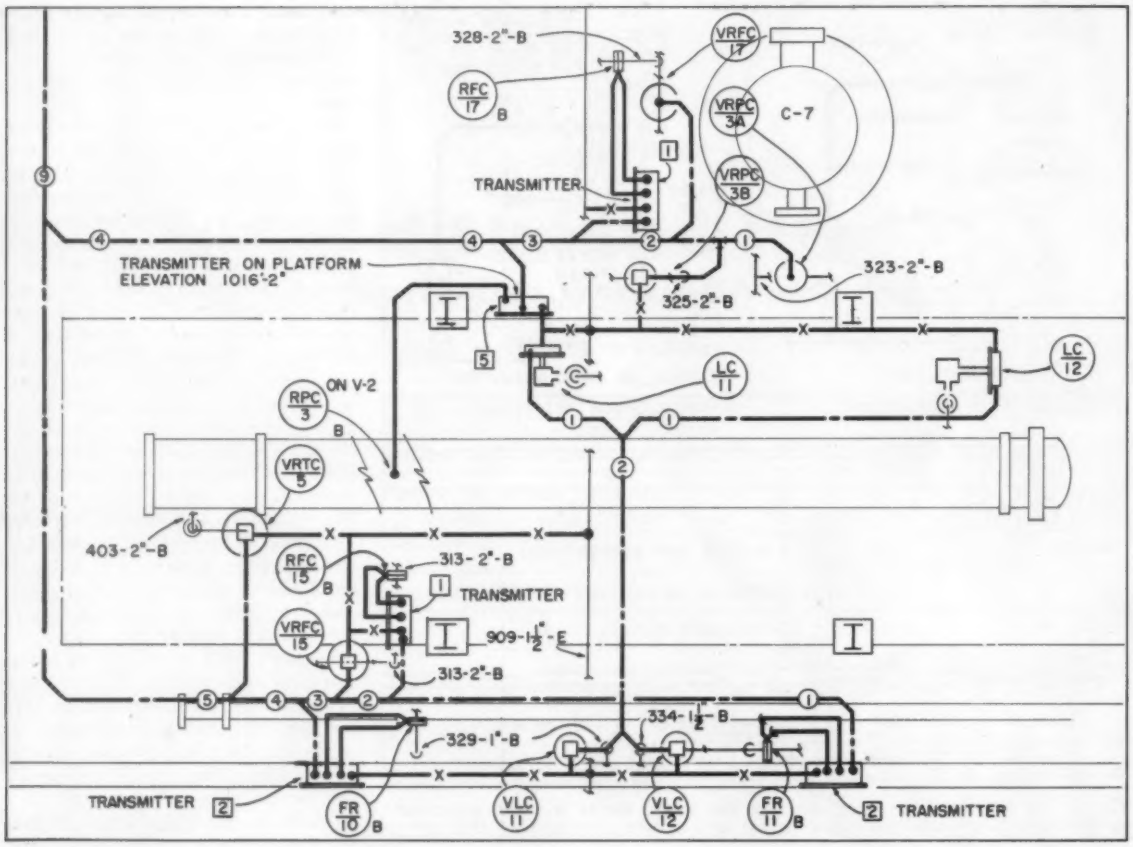


Fig. 4. Inclusion of major equipment and the building elements is a good idea for locating instruments and the related items

fittings of many designs, and use of insulated tube bundles, have simplified the problem of installing tubing.

It may be well at this point to emphasize the importance of training a group of men for instrument drafting. These men must have a basic knowledge of piping drafting so that they feel at home with a piping layout drawing. If the instrument installation standards exist, it is not difficult for a draftsman to become familiar with the manner of showing them on a layout.

If standard installation diagrams and piping must be developed, the more instrument knowledge the draftsman has acquired, the more he can accomplish without constant supervision. Someone must be cognizant of rules for location of primary elements for best measurement. Such considerations as adequate length of straight runs ahead of orifice plates, location of pressure taps at points which will give reliable readings, and many others are imperative.

The experienced draftsman may work with the piping draftsmen to locate these items on the original piping drawings. In the absence of this type of personnel, the instrument engineer must spot the items for the piping draftsman.

It becomes a little difficult to explain the procedure of an instrumentation job in order, one move after another, when some steps must, and will, occur simultaneously. One of these is the analysis of quotations. This usually occurs at the same time that piping drawings and installation details are progressing.

Instrument quotations may be divided according to instrument function so that prospective suppliers may be selected for their ability to supply acceptable units for each classification. They may also be divided to include all instruments in one section of a plant. Whichever system is used, the dates for receiving quotations will be staggered necessarily—a condition which relieves the work load.

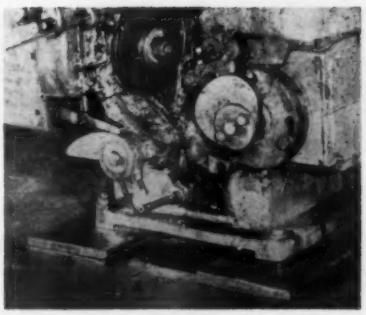
As each group of quotations is received, the individual bids must be compared for proper selection. Comparison requires an analysis of each item to determine: 1. Whether or not the instrument will accomplish the desired function. 2. Whether or not its pressure ratings, temperature ranges and all physical characteristics are satisfactory. 3. Whether or not accessories are included or must be purchased separately. 4. Whether or not the price reflects the same scope of functions within each competitor's quotation. Advantages and disadvantages of each offering must be listed. Delivery dates must be evaluated with respect to design, construction schedule.

When this data has been assembled, the selection decision must be made preferably in conference consisting of representatives of all groups involved in completion of the project. The experience of the operating department must also be tapped.

Selection of a supplier signifies acceptance of the characteristics of this supplier's line of instruments. It becomes necessary to review each item with the supplier. Design must be revised to reflect the dimensions, operational features and installation requirements of the instruments which will now be ordered.

This phase of an instrumentation project which has been discussed represents a major portion of the manpower requirements of the job. From this phase on, most of the work consists of expediting, refinements of the entire installation, and hand tooling the inevitable revisions.

Fig. 1. Above: Line of cold headers at Mosow plant show type of machines isolated by pads



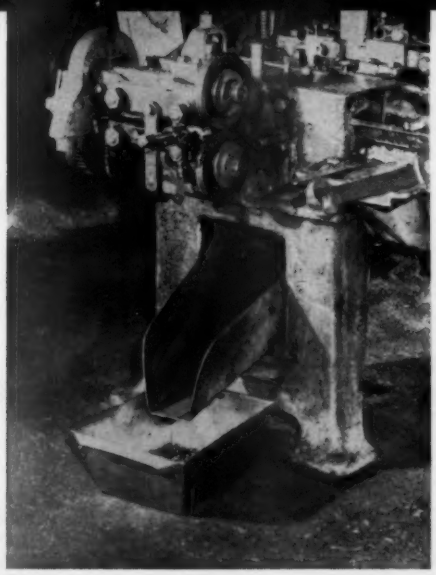


Fig. 2. Pads under solid die header's feet were simply cut to size of machine footing

Fig. 3. Some of heavier machines such as this solid die header required steel shims as well as pads to be placed under comparatively small footings to spread the load

What's the Price of Plant Changeover?

By J. E. and W. A. MOSOW, Mosow Screw Co., Waukegan, Ill.

WHEN WE MOVED into our new 60,000-sq ft building in early 1953, we were able to achieve many plant engineering improvements which were impracticable in our old plant. A major improvement was in our method of preventing "walking" of cold headers, thread rollers, screw slotters and presses used in making bolts, screws and fasteners of many types and sizes.

A total of 69 machines, weighing from 500 lb to 15 tons each, were moved initially into the new plant. The reciprocating weight in each machine has a periodic shock motion that is virtually linear. While our punch presses have a vertical motion, the cold headers—with wire capacities from 3/16 in. to ½ in.—"rock" almost horizontally. On the other hand, the rams on all the semi-automatic thread rollers—with wire capacities from ⅛ in. to ½ in.—oscillate at an angle of about 35 deg to the floor. The screw slotters were the only machines where we were concerned solely with continuous vibration and not heavy periodic shock.

The headers of various capacities operate at from 60 to 120 actions per minute in a total stroke length of up to 9 in. on the larger sizes. Strokes up to the same length are produced in our thread rollers at rates from 85 to 170 actions per minute. Repeated shock of such frequency in heavy machinery can cause walking at rates as high as 2 ft per hour. Floor damage, disconnection of power lines, and excessive noise are among the many very good reasons for completely eliminating walking.

All production machines were anchored at the old plant. Two lengths of concrete bedding, one for each pair of machine feet, were constructed in the plant floor where each machine was to be located.

This method of preventing walking had four distinct drawbacks which had to be avoided in the new plant:

1. The machine layout was inflexible. Once a machine was located and anchored, it was expensive to prepare new bedding in another place. We then didn't have the freedom we would have liked to relocate machinery for maximum production efficiency as the product demand changed.

2. The timber construction was too complicated. Too much time was spent in breaking flooring, pouring cement, preparing and laying the timbers, and bolting down the machine feet.

3. It was necessary to tighten the nuts at the machine feet periodically. The repeated stressing of the bolts as the shock was transmitted through the feet eventually pulled the bolts into the timbers. The nuts would then loosen and the machine begin to bounce.

4. Excessive plant noise and vibration transmitted through the floor.

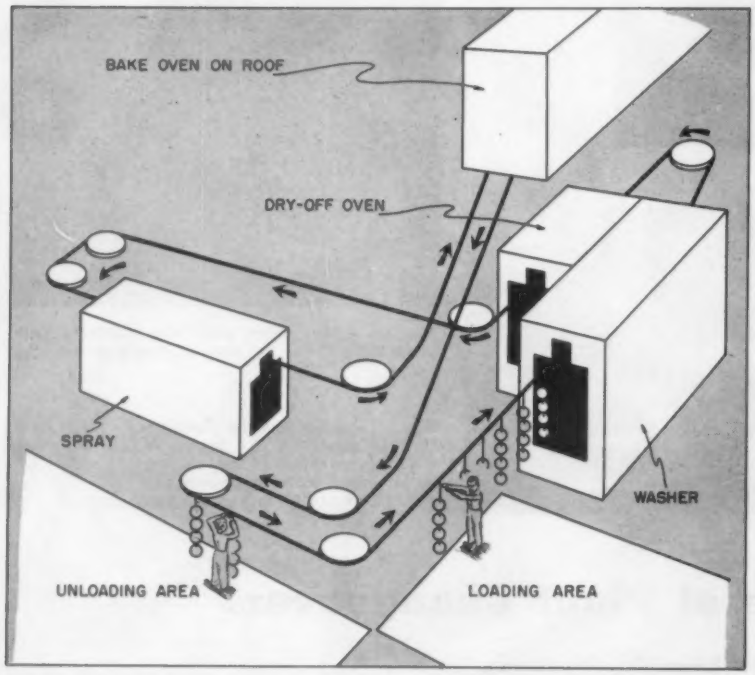
Each of these factors, of course, is also undesirable in most metal-working plants and is characteristic in some degree of all methods which involve securing the machine rigidly to the floor.

All production machines at the new plant, such as the line of cold headers in Fig. 1, were mounted on neoprene pads, with no need for special floor bedding or bolting of any kind. The Isomode Pads, made by the MB Manufacturing Co., New Haven, Conn., are designed to absorb the machine shock and substantially reduce transmission of vibration to the plant floor. The 5/16-in. thick neoprene vibration-isolating pads have parallel rectangular ribs in opposite directions on either side.

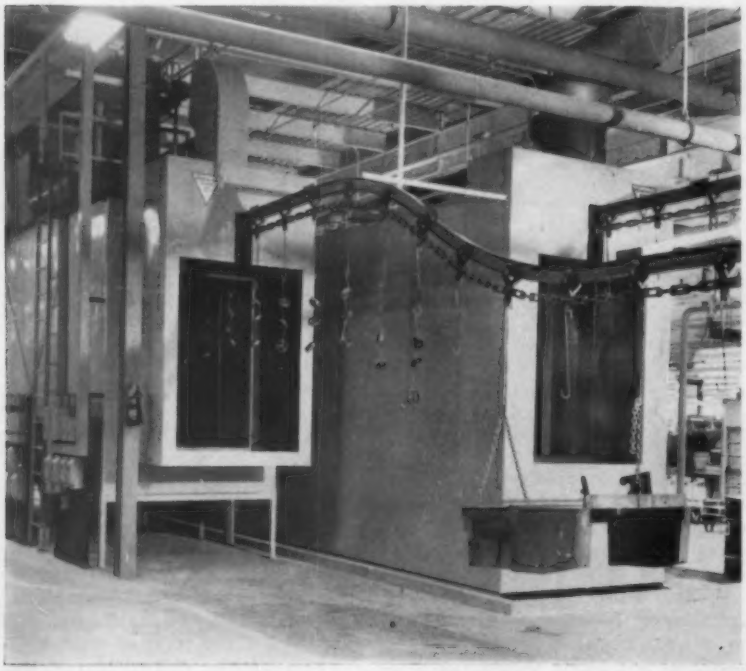
The size of pad required under each foot of a machine was selected on the basis of the actual weight that had to

(Continued on page 260)

New Paint Spray System Cuts Finishing



FLOW DIAGRAM This metal processing and paint finishing system includes a three-stage washer, dry-off oven, two-man spray booth and a baking oven



WASHER—DRY-OFF OVEN Parts enter three-stage washer, right, then return through dry-off oven, left. From here, parts go to spray booth, then baking oven

In addition to reducing man-hours, the system also saved the company valuable floor space . . . This was possible by installing the baking oven on the roof . . . Total space saved: 1274 sq ft

PAINTING QUANTITIES of 1000 different parts of G. H. Tennant Company's power sweepers, floor machines and other equipment presented some production headaches until they switched to this new paint finishing system.

Thanks to this new system, washing and drying of these parts (some weighing as much as 800 lb) has been greatly increased. In addition, the system has improved the time for spraying and baking the prime coat and the bright orange and cream finish coat.

Use of a continuous conveyor enables the company to do in 24 man-hours what used to take 80 man-hours, and assures a better finish.

This new finishing system includes a three-stage washer, dry-off oven, two-man spray booth and a 74-ft baking oven. To save valuable floor space, the baking oven was installed on the roof.

Ordinarily there would have been some installation problems because of the weight of this oven which is over 57 tons. In addition, loading is 90 psf.

However, installation was not too much of a problem because the design of the entire system was coordinated with the architect who designed the building. As a result, a substantial savings in support steel was possible. Because of this design coordination, the company was able to save approximately $1000 in steel that would otherwise have been necessary to reinforce the roof to support the oven.

This oven has a base which measures 13 ft by 74 ft. There also is an operational enclosure with a base of 12 ft by 26 ft. This comes to a total of 1274 sq ft and a weight of 114,660 lb.

This additional 1274 sq ft of space is certainly well appreciated down below. But there are other advantages to this roof oven besides extra floor space.

Time from 80 to 24 Man-Hours

All parts to be baked enter and exit through the underside of the oven. This bottom loading gives a very efficient natural heat seal. Since hot air rises, the air virtually returns to its source. This eliminates the problem of heat sealing which would be necessary if the openings were at either end.

Another advantage is the elimination of excessive radiant heat to nearby workers. The unavoidable heat radiation from an oven operating at 330 F is, happily, in this case, up on the roof.

Here is how this new finishing system works.

Metal parts, from basket loads of small units to large frames (measuring 4½ by 5 by 6 ft), first enter the 44-ft washer where an acid pressure spray converts the surface to an iron-phosphate coating. This is followed by a cold water rinse, then a hot rinse that hardens the rust-resistant and corrosion-resistant phosphate salts.

The parts then pass immediately into the 34-ft dry-off oven which is maintained at 350 to 400 F, depending upon the size of the parts.

Through Spray Booth

After this, the parts are carried to the downdraft filter spray booth where two men apply the prime coat or either of the orange or cream finish coats.

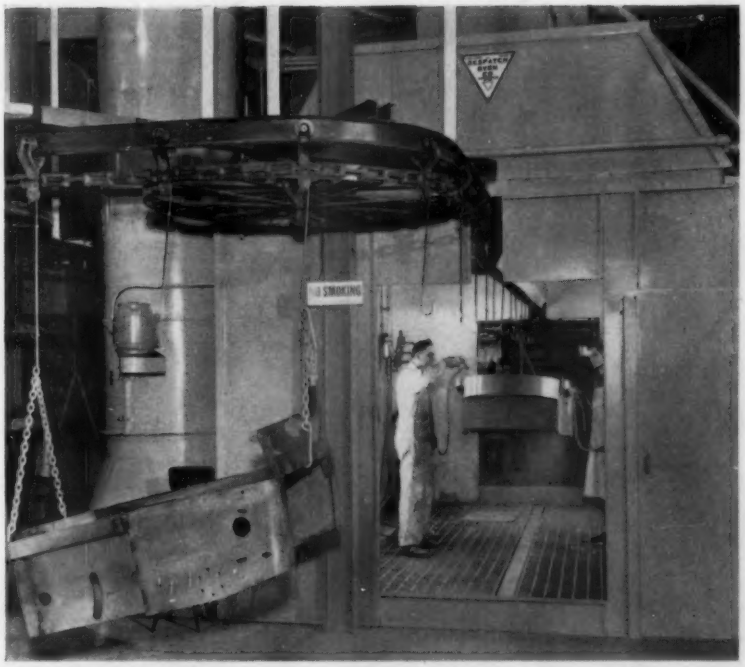
Speed of the 500-ft conveyor is approximately eight feet per minute, giving the sprayers sufficient time for any of the 1000 different parts requiring finishing.

After the prime coat is sprayed and baked on, the parts go through the system again (washer is temporarily shut off) for spraying and baking of the finish coat.

The 74-ft bake oven is installed on the roof of the one-story plant to save valuable floor space. Just-sprayed parts travel up and into the oven through an underside opening. Baking lasts eight minutes at 330 F, in two passes.

This finishing system will handle 100 to 150 loads at one time, with the complete cycle for one coat requiring only 60 minutes.

This system was engineered, built and installed by the Despatch Oven Co., Minneapolis, in cooperation with the G. H. Tennant Co.



SPRAY BOOTH Conveyor speed of 8 fpm gives sprayers time to handle basket loads of small parts or the very large frames, several of which are illustrated

BAKING OVEN By mounting oven on roof, the company saved 1274 sq ft of space. Oven measures 13 ft by 74 ft long. Operational enclosure is 12 ft by 26 ft

Construction

Fig. 1. The light weight of plastic materials simplified handling during installation. Here, a sandwich-type curtain wall panel is lifted into place by two men

Fig. 2. Plastic-faced concrete blocks, acrylic louver windows and the plastic

USE OF PLASTICS for industrial construction purposes will be subjected to the acid test in the new Monsanto Chemical Co. research center.

The testing of plastic materials is being conducted on both a literal and figurative scale. Built to house research personnel and activities of the Inorganic Chemicals Division, the structure calls for practical applications of plastic building materials from footing to rafter and points between on both internal and external walls.

From the exterior surface, nearly 100 per cent of plastic, through almost every part of the interior, more than 80 different plastic applications are demonstrated.

The building, now nearing completion in suburban St. Louis, is a three-story structure of about 70,000 sq ft of floor space. It contains 40 chemical research laboratory modules, a special section for chemical engineering research offices, a library and service facilities for the research personnel.

Here are some examples of the part plastic building materials are playing in the construction of this new research laboratory.

Sandwich-type curtain wall panels are just one of the three plastic materials used on the exterior of the building. They weigh 70 lb versus more than 300 for a metal sandwich panel of comparable size. This weight factor has also been helpful in handling these materials during installation. The panels can be easily lifted into place by two men.

Old and New Plastic Uses

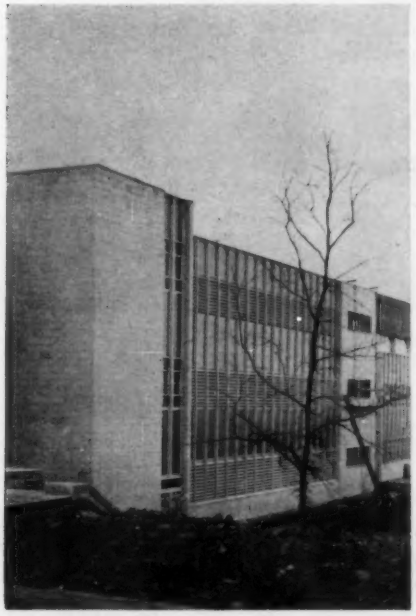
The exterior and interior color of the panels is "built in" of polyester resin reinforced with glass fiber cloth. A two-inch core of foamed styrene provides insulation equivalent to a 16-in. brick wall.

In addition to the panels, plastic-faced concrete blocks and acrylic louver windows are the other two plastic materials that make up most of the exterior surface. The louver-type acrylic windows permit passage of pleasant indirect light while filtering out the direct rays of the sun in addition to providing high insulating qualities.

Plastic partition panels is just one of the many interior applications. These panels, fabricated of high impact styrene extrusions, slip conveniently into standard steel frame channels and provide a snug fit. Since these reinforced polyester sheets are varicolored, the usual need for finish painting is eliminated.

An unforeseen dollars and cents savings was realized through the use of plastic-coated plywood as a form material. The greatly expanded reuse plus the reduction in cement finishing necessary after the forms were removed more than offset a higher original cost of the form material. Smooth surface of the ceilings shown in Fig. 5, on which no finishing was

Plastics Are Put to the "In-Use" Test



curtain walls make up most of the exterior surface of the new research center

Fig. 3. An example of the ease of adaptation of standard construction materials is shown in the plastic partition panels which are being installed in the building

necessary after removal of the forms, is typical.

Plastic pipe is used extensively in the complex piping system which is typical of chemical research laboratories. Many of the intricate joints of the plastic piping were welded on the job. Three of the pipe lines installed in the building are of insulated metal; six lines are of polyvinyl chloride.

Plastic is also being used in the roof of the building. A two-inch layer of foamed styrene was installed in the roof because of its high insulating qualities. Sheets of asbestos board were placed on top of the foamed styrene for protection against limited roof traffic.

In addition to the extensive use of plastic in building materials, quite a bit of the equipment in the laboratory is made of plastic. One example of this is the use of an all-plastic fan to exhaust chemical fumes in certain laboratory areas.

An important safety factor of this

Fig. 4. Because of its light weight, each workman can carry a complete window

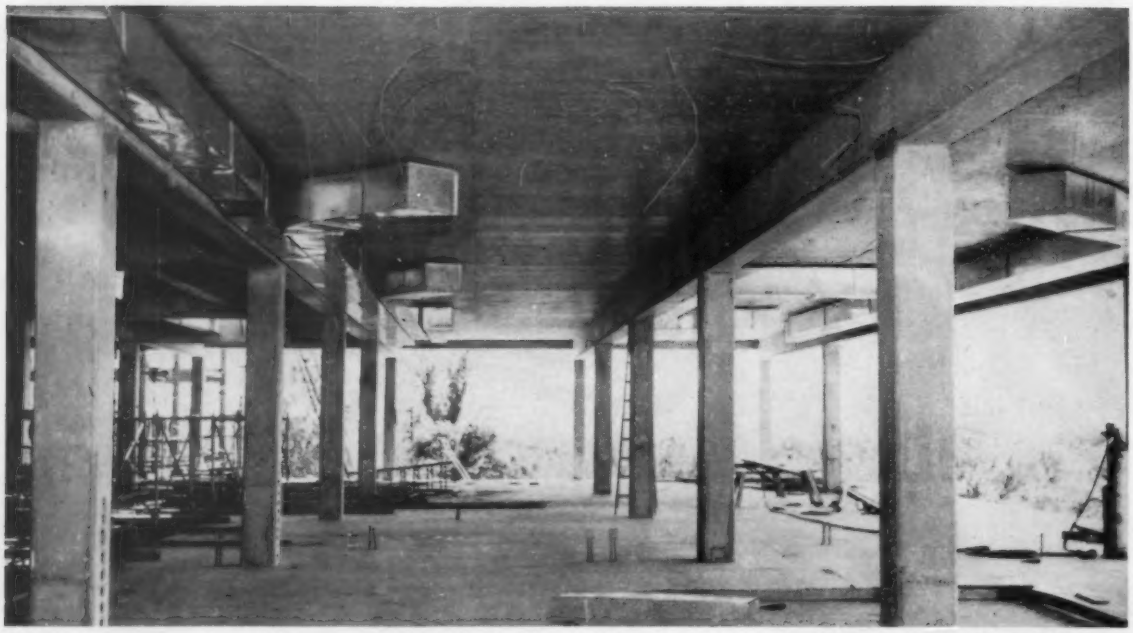


Fig. 5. A dollars and cents savings was possible by the use of plastic-coated plywood as a form material. Smooth surface of ceiling shown here, on which no finishing was necessary, is typical. These forms can be reused many times

Fig. 6. Plastic pipe is used extensively in this chemical research laboratory

Fig. 7. Plastic fans—27 in all—will be used to exhaust the lab chemical fumes

Fig. 8. Foamed styrene was used to insulate the roof of the new research building. A conventional laid up roof is placed on top of a two-inch layer of plastic

fan's design is that it is impossible to "accidentally" reverse the flow and send toxic fumes back into the confined area where they might endanger the health of the employees. The air blows in the same direction, regardless of the direction of rotation of the blades.

These fans are designed to cover air delivery from 1000 to 2100 cu ft per minute, with a static pressure of five-eighths to more than one inch of water gage and speeds between 1200 and 1700 rpm with the use of fractional horsepower motors.

From Furniture to Floor Tiles

In addition to the uses described on these pages, plastics also will appear in doors faced with melamine, acoustical ceilings of vinyl-clad fibrous glass, reinforced polyester furniture, melamine bench tops in laboratories, vinyl asbestos floor tiles, isocyanate foam for sound insulation, vinyl drapes and stairwells that will have plastic-coated hand rails, polyester risers and vinyl treads.

Some of the new uses of plastic employed in this laboratory will be: urethane corrosion resistant structural steel paint, laminated polyester and urethane foam structural support for front canopy, polyester control dampers on laboratory hoods and polyester closing strips on mullions.

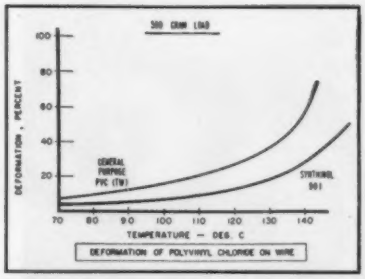
Architects for the building were Holabird and Root and Burgee of Chicago. General Contractor was the William H. and Nelson Cunliff Construction Co. of St. Louis.

Troubled with wiring failures in your plant?

If so, consider the record being established by Rome Synthinol 901, a special 90° PVC compound for wire insulation and sheathing. It has helped to solve an impressive list of difficult wiring problems.

Developed by Rome Cable's laboratory and first introduced in 1949, Rome Synthinol 901 has proved by test and actual use to be superior to conventional PVC compounds in the following ways:

a. Suitable for continuous operation at higher temperature (90°C).
b. More stable under severe heat cycling.
c. Suitable for continuous immersion in hot transformer oil.
d. Superior resistance to chemicals and solvents.
e. Greater resistance to heat deformation.



Graph shows heat deformation vs. temperature, and compares Synthinol 901 with conventional PVC compounds. Test run in accordance with Underwriters' Laboratories standard procedure, except for temperature.

The practical value of this compound can best be illustrated by describing a number of actual case histories.

(1) Oil refinery, industrial and chemical plant wiring.

Plant and oil refinery engineers have long used conventional PVC insulations for plant wiring with good results, but too often heat deformation problems arose in warm locations. Since Rome Synthinol 901's superior deformation resistance suggested that it might be the answer to this problem, it was tried and soon became widely used because of its much better service record.

Synthinol 901 also proved to be far superior to conventional materials for chemical plant wiring where the corrosive action of chemicals and solvents has always been a tough problem. Although polyvinyl chlorides as a class have inherently better resistance to chemicals and solvents than many other materials, some engineers desired even further improvement. One user decided to test a number of samples over a long period by immersing them in various concentrations of acetone, different alkalis, and butyric, propionic, and acetic acids. The results of this careful evaluation showed clearly that, when exposed to these chemicals, Synthinol 901 would last longer than any other PVC tested.

(2) Oil-filled transformers.

Transformer engineers have long sought a cable construction to replace varnished cambric-insulated cable for leads in oil-filled transformers. These leads connect transformer windings and bushings and are constantly immersed in hot oil. One transformer manufacturer, encouraged by successful experience with Synthinol 901 on other applications, undertook a comprehensive study of the possible usefulness of this insulation in lieu of varnished cambric for high-voltage transformer leads. This study extended over a several-year period and proved to those engineers involved that there were at least four reasons for standardizing on Synthinol 901 for this application:

a. There was less sludge in the oil than when VC insulation was used.
b. There was no harmful degradation of the electrical properties of the oil.
c. Conductors insulated with Synthinol 901 ran cooler, permitting a 7% increase in lead cable current rating.
d. The use of Synthinol 901 in lieu of VC would permit substantial dollar savings.

(3) Coil leads.

Many manufacturers of small coils for relays, small transformers, small motors, and electronic components have tried to use PVC insulated lead wires for many years. Typically, these leads are crimped or soldered to the ends of the coil; and the whole coil is then impregnated with varnish or wax and baked as long as 16 hours at temperatures as high as 150° C. The varnish used may be asphaltic, phenolic, alkyd, etc.; and the wax may be paraffin, beeswax, carnauba, or another kind.

PVC insulated lead wires frequently produced serious production problems because of the insulation's tendency to shrink, crack, and stiffen during the impregnation and subsequent baking period. Synthinol 901 was substituted in place of the ordinary PVC insulation and, after nearly eight years of wide usage, not a single case of shrinkage, cracking, or stiffening of insulation involving Synthinol 901 has been brought to our attention.

These case histories describe just a few of the applications for which Rome's Synthinol 901 has proved especially effective. Perhaps they will suggest other applications in your own area which might also be better handled with Rome Synthinol 901 instead of a conventional PVC compound. If you have a wire or cable problem that might be solved with Rome Synthinol 901, why don't you get in touch with us? Contact your nearest Rome Cable representative for more information—or write to Department 322, Rome Cable Corporation, Rome, N. Y.

ROME CABLE
CORPORATION

For more facts circle 568 on Reply Card

How Amperex Saves on Liquid Air Costs

LIQUID AIR is an important commodity around many industrial plants today where temperatures as low as –328 F must be maintained for routine processes and test procedures.

Amperex Electronics Corporation, Hicksville, N. Y., manufactures a wide variety of transmitting, power and special-purpose electron tubes. In this work, liquid air plays a vital role in removing vapors from the pumping systems which produces the vacuum in thousands of tubes every week.

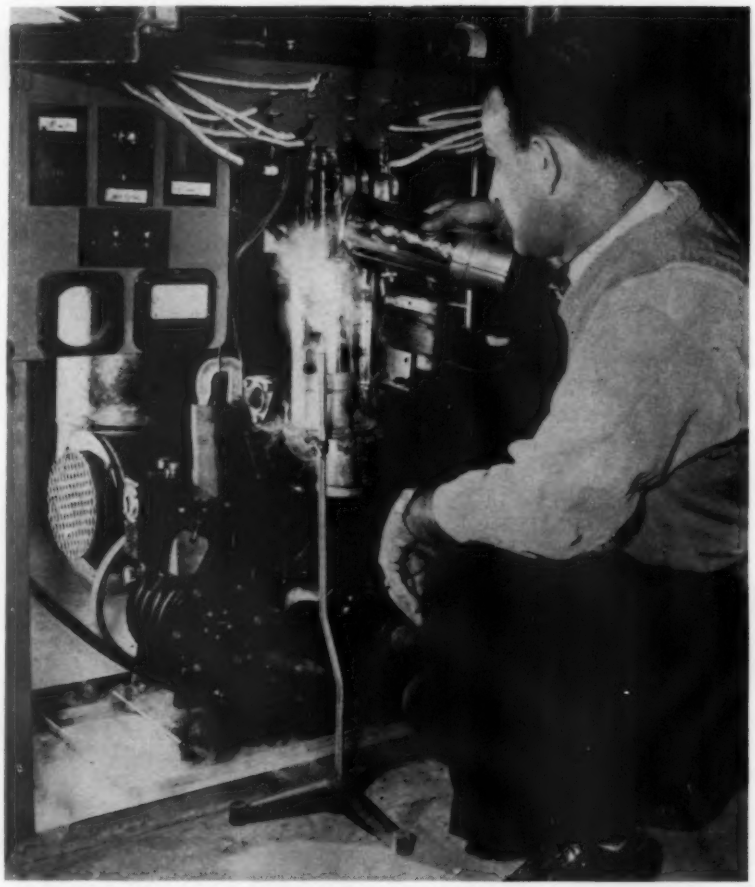
On June 14, 1956, the company installed a gas liquefier, a machine 37 in. long, 20 in. wide and 34 in. high. The unit is powered by a 10-hp motor and requires cooling water either from a recirculating cooler or from city mains. In operation, the machine produces more than 5 qt of liquid air per hour.

Before acquiring the gas liquefier, Amperex purchased 500 qt of liquid air each week at a cost of 50 cents per quart. A full year, 50 weeks, of manufacturing operation required 25,000 qt of liquid air and this represented an annual operating expense of $12,500. From accurate records kept over a period of years, it was proved that evaporation losses during plant shutdown overnight and on weekends accounted for 100 qt a week or 20 per cent of the purchased supply. This meant an annual wastage of $2500.

Now, after nearly a year of operation with the new machine, Amperex figures its cost of liquid air at $2700 annually, 21 per cent of former costs, or a saving of 79 per cent.

Here are the actual figures. Capital outlay for the gas liquefier was approximately $9000. Writing the investment off over a period of ten years, this amounts to $900 annually (without calculating interest on the investment). Another $800 is set aside for overhead, maintenance and space cost during each 12 month period.

Amperex operates the machine about 16 hr per day, 5 days a week, a total of 4000 hr a year. Energy and water costs are calculated at 25 cents per hour for a total annual expenditure of $1000. Adding these items, $900 plus $800 plus $1000, the result is $2700.



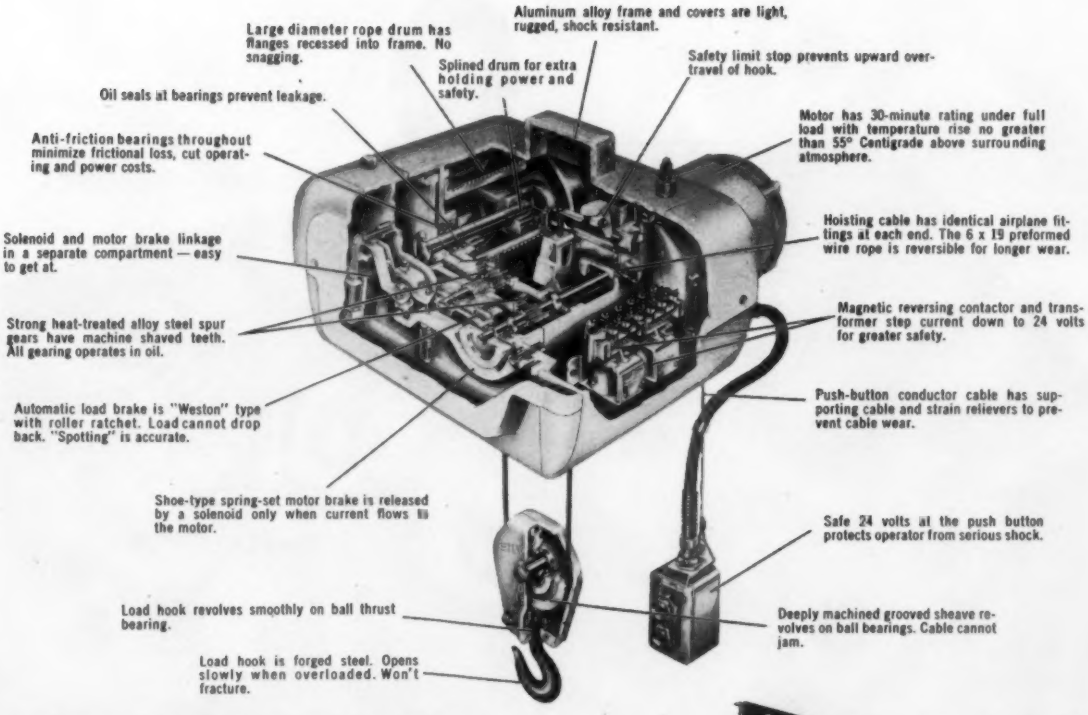
Amperex Electronics Corporation employs liquid air to remove moisture from exhaust equipment which is used to produce the vacuum in electronic tubes. Here liquid air is poured into flask surrounding trap in which moisture condenses

The company employs liquid air not only for its vacuum pumping system but also for other purposes such as freezing rubber prior to machining operations. The plant opens at 8:30 am and the gas liquefier goes into operation at 7 am.

There are two eight-hour working shifts, the first finishes at 5:30 pm, the second at 1:30 am. Normally, the machine is shut down at 11 pm after a continuous run of 16 hr. Since the unit requires only one hour in twenty-four for defrosting, the period from midnight to morning is more than ample for this daily routine. The gas liquefier, made by Instruments Div., Philips Electronics, Inc., is installed in a separate building having a floor space that measures 30 by 60 ft.

Liquid air flows from the gas liquefier spout into 25 and 50 liter Dewar containers. The neck opening is of small diameter and this minimizes evaporation. Smaller vacuum bottles are filled from the large containers in order to facilitate handling of the super-cold liquid throughout the plant.

The new gas liquefier is under the supervision of Jack Kings, plant engineer, who is responsible for its operation and maintenance.


Aluminum alloy frame and covers are light, rugged, shock resistant.
Large diameter rope drum has flanges recessed into frame. No snagging.
Splined drum for extra holding power and safety.
Safety limit stop prevents upward over-travel of hook.
Oil seals at bearings prevent leakage.
Motor has 30-minute rating under full load with temperature rise no greater than 55° Centigrade above surrounding atmosphere.
Anti-friction bearings throughout minimize frictional loss, cut operating and power costs.
Hoisting cable has identical airplane fittings at each end. The 6 x 19 preformed wire rope is reversible for longer wear.
Solenoid and motor brake linkage in a separate compartment — easy to get at.
Magnetic reversing contactor and transformer step current down to 24 volts for greater safety.
Strong heat-treated alloy steel spur gears have machine shaved teeth. All gearing operates in oil.
Push-button conductor cable has supporting cable and strain relievers to prevent cable wear.
Automatic load brake is "Weston" type with roller ratchet. Load cannot drop back. "Spotting" is accurate.
Shoe-type spring-set motor brake is released by a solenoid only when current flows in the motor.
Safe 24 volts at the push button protects operator from serious shock.
Load hook revolves smoothly on ball thrust bearing.
Deeply machined grooved sheave revolves on ball bearings. Cable cannot jam.
Load hook is forged steel. Opens slowly when overloaded. Won't fracture.

TOP QUALITY SPELLS TOP PERFORMANCE FOR YOU

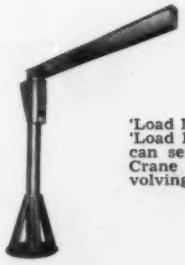
This is the Series "600" 'Load Lifter', the tough wire rope electric hoist with a well-earned reputation for speeding production. The ½-ton size lifts at 30 FPM at the push of a button. Only 24 volts at the push button means a big plus in safety.

The "600" has few functional parts and has anti-friction bearings throughout. That means less wear and lower power and operating costs — economy! Strong construction is combined with lightness for stamina and easy movement on the I-beam. Your service man won't see much of this hoist, yet every part is easily accessible by removing covers *while the hoist is in the air!*

Check the construction of the Series "600" 'Load Lifter'. Compare its quality, performance and low headroom with other makes. You will be convinced that here is the best value in its class. ½ and 1-ton capacities available in lug or hook suspension or with plain or motor-driven trolley. *Your "Shaw-Box" Distributor will gladly give you full details — or write us for Bulletin 408.*

Series "600" 'Load Lifter' with push-type trolley equipped with ball-bearing wheels for smooth, easy travel even on curves. Trolley adjustable to fit various I-beam sizes.

Series "600" 'Load Lifter' with motor-driven trolley that travels at 100 FPM — saves time and energy — smooths out production flow. Trolley available separately for "600" hoists already in service.



'Load Lifter' Jib Cranes. A "600" 'Load Lifter' Hoist on this crane can serve a 550 sq. ft. area. Crane is self-supported, full revolving. Capacities to 5 tons.

57 F-2

MAXWELL MANNING M&M MOORE INC. TRADE MARK

'Load Lifter'® ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.

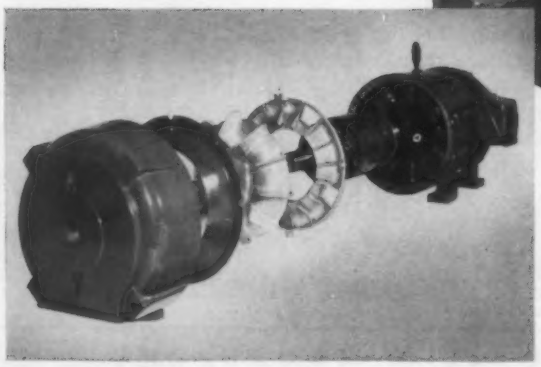
SHAW-BOX CRANE & HOIST DIVISION

362 West Broadway • Muskegon, Michigan

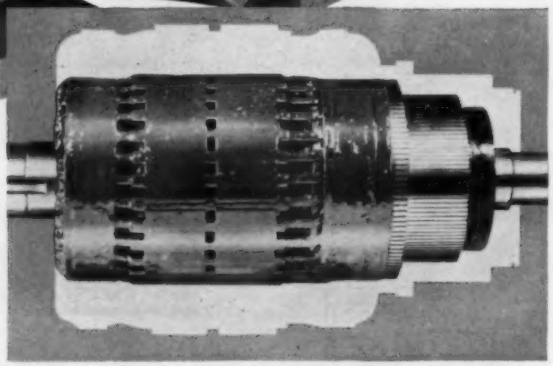
Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and 'LOAD LIFTER' Hoists and other lifting specialties. Other Divisions produce 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves, 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments, and Aircraft Products.

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Avenue Road, Galt, Ontario.*

For more facts circle 569 on Reply Card



NEW CONTROLLED VENTILATION—pushes air through the motor from drive end to commutator end, opposite to the ordinary direction. Armature cooling is increased... harmful brush dust created at the commutator is blown out of the motor.



NEW LEVEL OF RESPONSE—Improved ventilation makes up to 55% lower armature inertia possible without sacrifice in capacity. Life-Line "H" gives the fastest accelerations and regulating speed changes for more and better production.

Westinghouse *Life-Line H* with silicone insulation

FASTEST RESPONSE OF ANY STANDARD INDUSTRIAL MOTOR

Life-Line® "H" Backs Up Lowest Inertia With High Commutating Ability for Increased Production

Highly responsive drives are essential to fast automatic processing. No other d-c drive provides as fast speed changes as the Westinghouse Life-Line "H".

Efficient controlled ventilation makes possible the long, slim design of the Life-Line "H" armature, reducing inertia as much as 55% without sacrificing any capacity. 35% increase in commutating ability backs up this lowest inertia to produce the fastest response available in standard industrial d-c motors today.

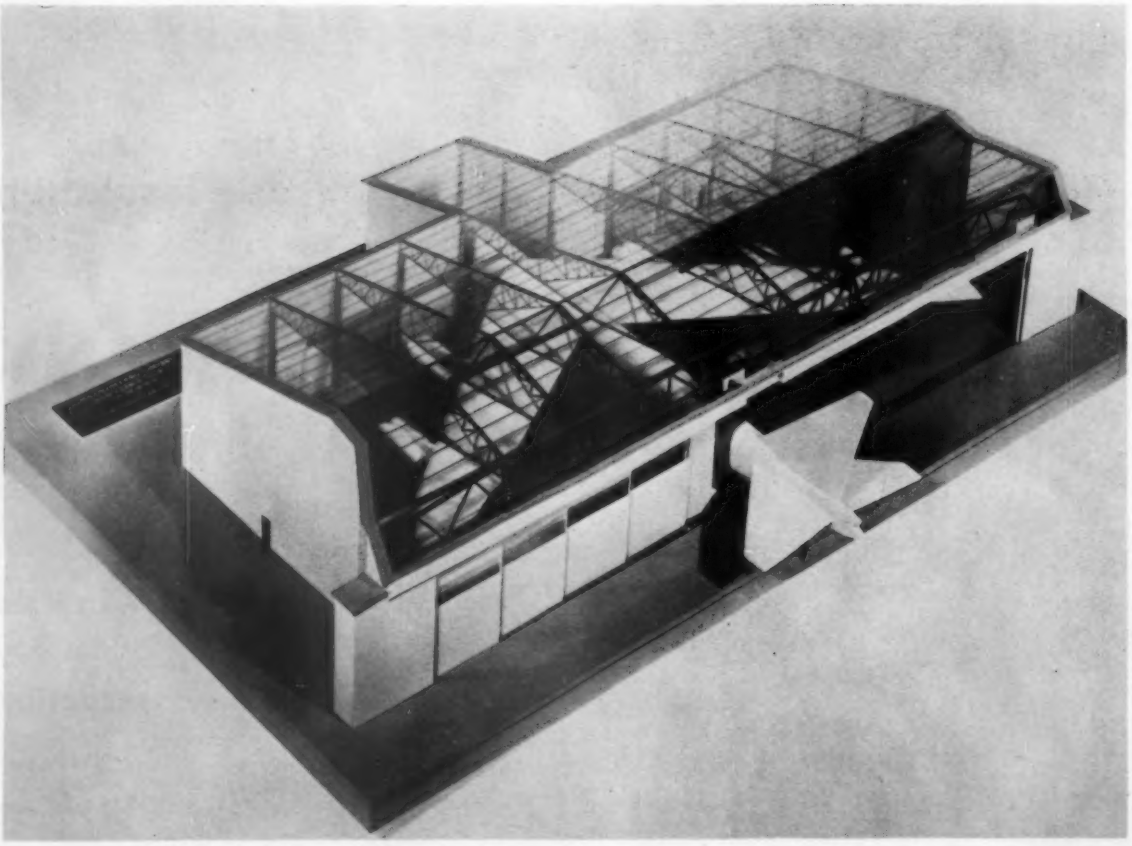
In addition, the new Life-Line "H" with silicone insulation, offers many dividends in long-term dependability and minimum maintenance. For all the facts about Life-Line "H" call your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa. Ask for B-7056. J-21991-C

NEW HOUSING DESIGN—provides maximum protection—eliminates need for splashproof enclosures in many cases. All access openings are sealed with covers . . . single ventilation opening in each bracket faces directly down.

YOU CAN BE **SURE**...IF IT'S

Westinghouse

For more facts circle 570 on Reply Card



Phantom view of model for USAF maintenance dock with B-52 in position for maintenance. Doors can be positioned, depending on weather conditions, to provide maximum comfort for the maintenance crews servicing the airplanes

New Maintenance Concept—

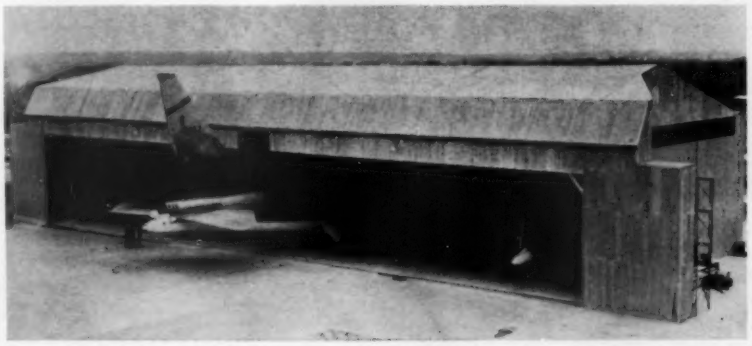
Here's the Structure That Makes It Possible

MAINTENANCE problems of the USAF's complex military aircraft are being met with unique solutions. One of these, recently announced, is a specially-designed steel structure planned to provide maintenance crews with maximum protection from the weather combined with utmost accessibility to all parts of the plane. In addition the building has the highly important advantages of fast, easy erection and low initial cost.

Unveiled at Carswell Air Force Base, the new building was developed and built cooperatively by various branches of USAF, Wright Air Development Center, and Luria Engineering Co. Roofs and sidewalls of the building are of galvanized steel sheets and are insulated with rigid glass fiber panels. Because of its unique design features the building can be erected in less than two months and mass production of the facility makes possible a cost of $200,000.

The dock is fitted with specially tailored, movable platforms to fit each of the five types of aircraft it is designed to house and service. Other features of the maintenance dock structure include: electrically operated bridge crane for engine removal; concentrated illumination in all work areas and complete overall lighting; built-in CO_2 fire extinguishing system; easy access compressed air distribution system; complete electrical service; sidewall illumination through glass fiber reinforced plastic panels.

B-52 in position for maintenance which can be started when platforms are in place

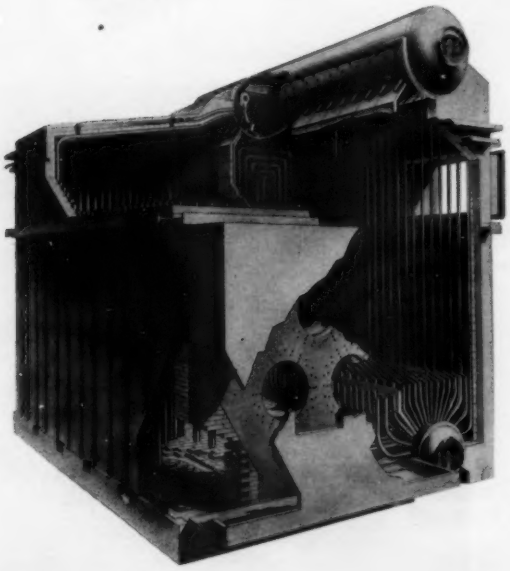


Here's why you get

IMPORTANT SAVINGS in

- ✔ *first cost*
- ✔ *installation*
- ✔ *operation*
- ✔ *maintenance*

with the FW Series "SC" STANDARD BOILER

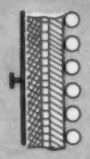


THESE nine Foster Wheeler design features add up to substantial savings in the cost of steam generation. Equally important is the extra *dependability* that's built into every "SC" unit — the result of over 60 years of experience in the design and construction of large, high-pressure steam generators for leading central station power plants.

Pre-engineered in all details and standardized for economy, these FW standard steam generators are available for oil or gas firing, in capacities from 50,000 to 150,000 lb/hr, for pressures to 1500 psi and superheated steam temperatures to 950 F. For complete information, send for Bulletin B-55-4. *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

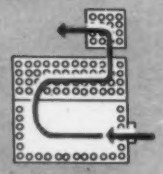
1. COMPLETELY WATER-COOLED WALLS

All furnace walls are cooled by closely-spaced tubes, minimizing setting maintenance and preventing excessive exit gas temperatures.



2. EFFICIENT FIRING ARRANGEMENT

Burner arrangement assures maximum rating without overheating furnace tubes. Rear wall is over 19 ft. from burner wall, permitting long, horizontal flame travel.



3. FULLY DRAINABLE SUPERHEATER

A completely drainable superheater permits removal of all condensed water from the elements before start-up.

4. HIGH STEAM PURITY

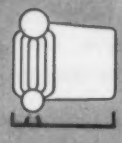
The normal drum internals consist of chevron dryers and a dry box. Separators may be added which make possible a steam purity of 1PPM or less.

5. UNRESTRICTED CIRCULATION

Absence of headers provides free circulation through integral risers and downcomers, eliminating header handhole plates and gaskets.

6. BOTTOM SUPPORTED UNIT

The bottom-supported design fully utilizes the structural strength of the tubes and provides low unit stresses in all members.

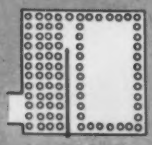


7. PRESSURE-TIGHT CASING

The all-welded casing forms a rigid, pressure-tight unit that can be arranged for pressurized or balanced draft operation.

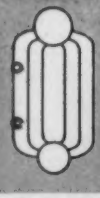
8. MINIMUM REFRACTORY BAFFLING

The wall separating furnace and boiler bank is the only refractory baffling used. It is completely accessible from the furnace.



9. SIMPLE SOOT BLOWER ARRANGEMENT

Soot blowers are supported on the outer row of boiler-bank tubes, simplifying alignment and providing easy access.



FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

For more facts circle 571 on Reply Card

THEY CHANGE THEIR OWN FILTERS-AUTOMATICALLY!

HERMAN NELSON

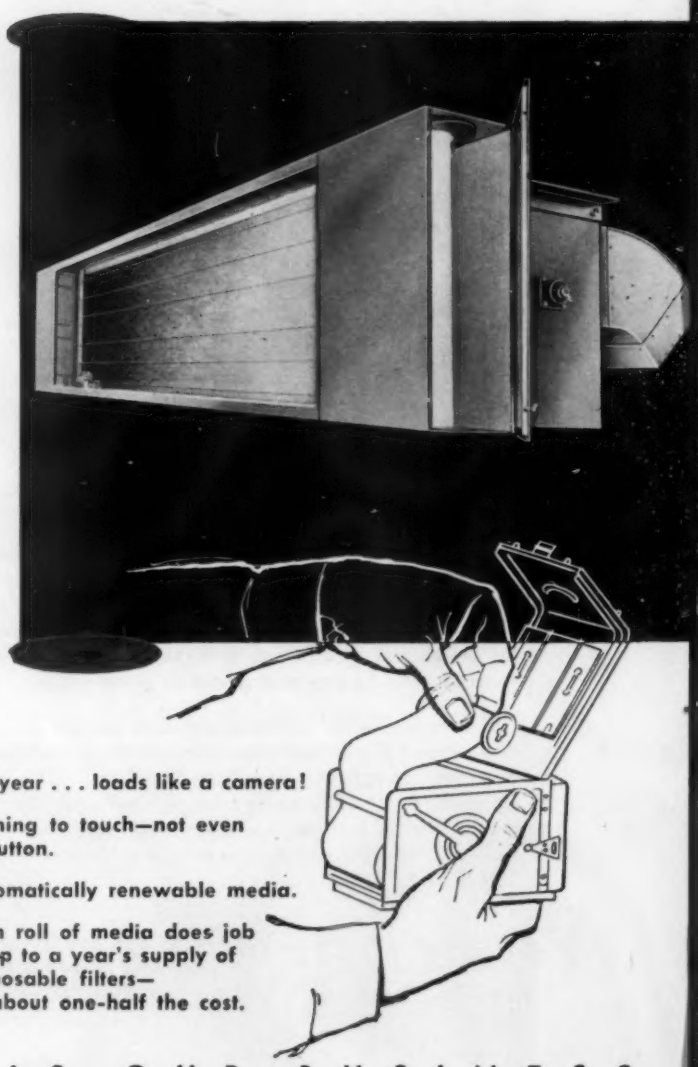
ROLL O VENT

AIR HANDLING UNITS

NEW, COMPLETELY AUTOMATIC IN OPERATION, the exclusive AAF Roll-O-Matic Air Filter Principle is now available on three leading Herman Nelson ROLL-O-VENT air handling units. You simply put the roll of media in the unit—*and forget it*—for up to a year! Operation is completely automatic, and under normal conditions costs just half that of ordinary disposable filters.

You gain maximum filtering efficiency *all year 'round*—with little or no maintenance. There is no reduction of efficiency in the system due to clogged filters. Furthermore, the system is always in balance—air flow *constant*—because clean media is automatically changed at just the right time!

Take advantage of the important time and cost-saving features provided by this exclusive AAF development. Write for full details on "packaged" Herman Nelson ROLL-O-VENT heating, ventilating and cooling units. Ask for fact-filled Bulletin 780. Address Dept. 228.

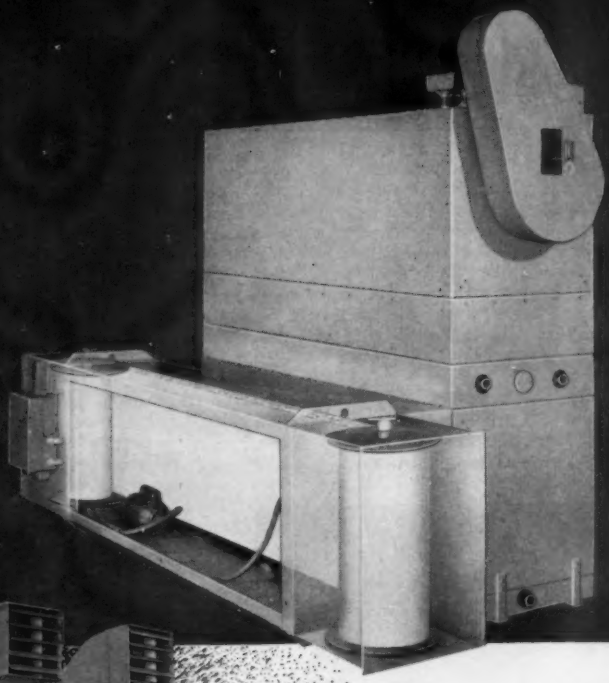


One roll of media lasts up to a year . . . loads like a camera!

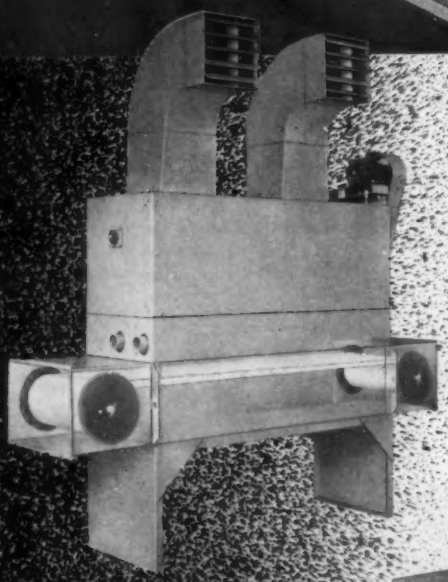
- **Nothing to touch—not even a button.**
- **Automatically renewable media.**
- **Each roll of media does job of up to a year's supply of disposable filters—at about one-half the cost.**

BETTER AIR IS OUR BUSINESS

For more facts circle 572 on Reply Card

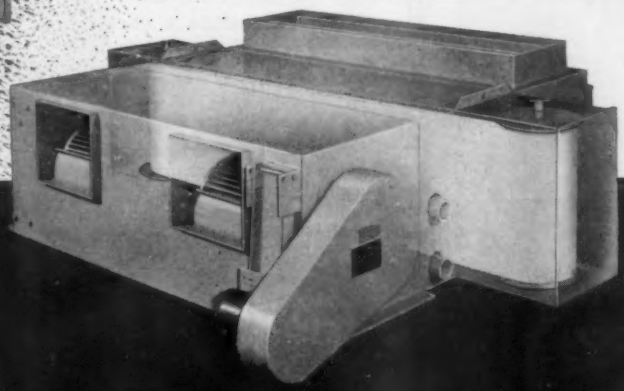


Herman Nelson
Roll-O-Vent
Air Conditioning Unit —*IT CHANGES ITS OWN FILTER—AUTOMATICALLY*



Herman Nelson
Roll-O-Vent
Industrial Unit Heater —*IT CHANGES ITS OWN FILTER—AUTOMATICALLY*

Herman Nelson
Roll-O-Vent
Heating And Ventilating Unit —*IT CHANGES ITS OWN FILTER—AUTOMATICALLY*



AAF
herman nelson

American Air Filter

Company, Inc.
215 Central Avenue • Louisville 8, Kentucky

NEW PLANT CONSTRUCTION — advance information on location, costs

Los Angeles, Calif. — Young's Markets, Inc., 1610 W. Seventh St., plans to construct a new plant, warehouse and office facilities for the preparation of meats and meat products. Plans call for a concrete, tilt-up masonry structure including a 128,000-sq ft warehouse, a 30,600-sq ft office, and a 43,200-sq ft meat plant. Albert C. Martin and Associates, 333 Beaudry St., are the architects and engineers.

Menlo Park, Calif.—Parke Davis & Co., Detroit, Mich., pharmaceuticals, surgical and biological products, plans to construct a new plant and administration building. New 30,000-sq ft building is scheduled for operation in the spring of 1958. Plant with equipment reported to cost approximately $500,000.

Denver, Colo.—Glenn L. Martin Co., Baltimore, Md., makers of aircraft and electronic systems, has announced expansion plans at its Denver division to cost upward of $2 million. Three new buildings are planned for completion in 1958.

Wilmington, Del.—E. I. du Pont de Nemours & Co., Inc., du Pont Building, has authorized construction of a new research laboratory at company's Chestnut Run Center for its pigments and electro-chemicals departments. New unit, to be used for work in titanium, silicon, pigments, sodium, peroxygen, chlorine, vinyl and related products, will cost $5 million.

Atlanta, Ga.—Gordon Foods, division of Sunshine Biscuits, Inc., plans to construct a new plant and general office building on local site here. Plant will produce potato chips and other snack items. Engineering work is already under way and company hopes to get construction work going as soon as possible. Estimate of cost reported to be in excess of $3 million.

Chicago, Ill.—Borg-Warner Corp., 310 So. Michigan Ave., plans to invest approximately $26 million in new plant and equipment facilities through 1957. About $6.5 million will be used to complete the $10 million chemical plant of its Marion Chemical Division, in Washington, W. Va. Company also will spend approximately $6 million for additions and improvements to its properties in the Chicago area, including construction of a new research center at Des Plaines, Ill. Borg-Warner will allocate balance of capital expenditures to its York, Norge, Warner Gear and Jackson divisions and a new plant at Auburn, Ind.

Mapleton, Ill.—Olin Mathieson Chemical Co., Mathieson Building, Baltimore, Md., manufacturers and producers of industrial, agricultural and organic chemicals, is constructing a new plant for the production of anti-freeze on local site, just 10 miles south of Peoria, Ill. The 90,000-sq ft steel and concrete structure will be the company's largest anti-freeze facility when completed in early 1958 and will cost $1.5 million.

Calvert City, Ky. — Air Reduction Sales Co., division of Air Reduction Co., Inc., 150 E. 42nd St., New York, N. Y., plans to construct a new plant

View of Texas Butadiene & Chemical Corporation's $30 million plant near Houston, Texas. The plant, which recently went on stream, was engineered and constructed by The Fluor Corp., Ltd.

for the production of methyl butynol for use in the perfume, pharmaceutical and chemical industries. New plant will have an annual capacity of three million pounds. New unit is scheduled for production by early 1958.

Covington, Ky.—Standard Oil Co. of Kentucky, Starks Bldg., Louisville, Ky., plans to construct a new terminal fronting about a quarter of a mile on the Ohio River, just below Bromley. New terminal will serve as a new receiving and distribution center and replace the old set-up at 25th St. and Madison Ave., Covington. Work will begin at once for completion early in 1958. Cost reported to be in excess of $500,000.

Lake Charles, La.—Cit-Con Oil Corp., jointly owned by Cities Service Co. and Continental Oil Co., has plans under consideration for a major expansion and construction program at its local refinery here. Work when completed in 1958 will represent an investment of about $4 million.

Grand Rapids, Mich.—American Motors Corp., Kelvinator Division, 14250 Plymouth Road, Detroit, Mich., plans modernization and re-tooling program of company's main Kelvinator appliance plant here. Improvements and equipment will be installed before the end of this year for manufacturing and insulating aluminum evaporators. Installation of a new single 19-station welding and forming machine will be included at a cost of $725,000. Cost of expansion, equipment and re-tooling reported to total $4 million.

Bound Brook, N. J.—American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y., plans to construct a secondary sewerage treatment plant adjacent to the Bound Brook Works of the Organic Chemicals Division. New unit will treat and purify company's wastes before they enter the Raritan River, and give secondary treatment to the domestic sewerage of Somerville, Raritan and Bridgewater, N. J. Cost of new installation reported to be approximately $4.5 million.

Princeton, N. J.—Socony Mobil Oil Co., 26 Broadway, New York, N. Y., plans to build a new nuclear research center. New facility will be operated as a sub-division of the Socony Mobil Research and Development Laboratory located a Paulsboro, N. J., and will be used basically for the study of radiation and the application of radiation to petroleum technology.

Waterford, N. Y.—General Electric Co., Schenectady, N. Y., is planning a two-story addition to company's research laboratory facilities here as part of a $3 million expansion program at company's New York silicone plants. New laboratory will be completed and in operation by the spring of 1958.

Belpre, O.—Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland, Calif., plans to construct a new plant on tract of land recently acquired for the production of aluminum foil. Cost of new facility reported to be in excess of $2 million.

Cleveland, O.—B. F. Goodrich Chemical Co., division of B. F. Goodrich Co., 2069 E. 9th St., plans to construct a new chemical plant on a 240-acre site on the west bank of the Illinois River, near Henry, Ill. Initial construction plans include several units: a processing building, an office-ware-

(Continued on page 265)

it's **boiler check-up** time!

Yarway Seatless Tandem Blow-Off Valve—angle-straightway combination.

HOW ARE YOUR BLOW-OFF VALVES?

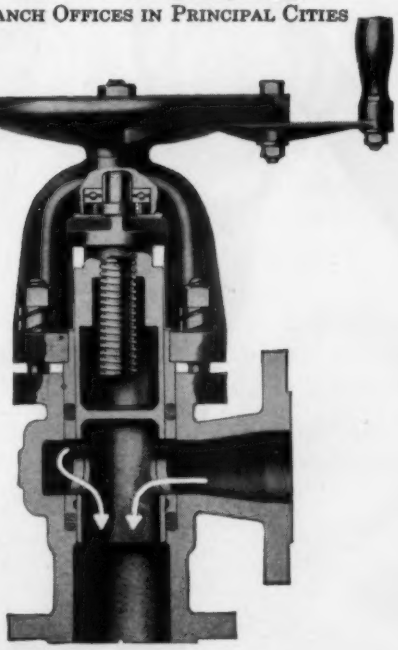
Are they drop-tight? Rugged and dependable? Easy to maintain?

Just as important, do they have all the advantages and up-to-date improvements in materials and design of new YARWAY Blow-Off Valves?

Old YARWAY Blow-Off Valves also can be overhauled and modernized, because all YARWAY improvements are *interchangeable* with parts on earlier models.

Write today for free YARWAY Blow-Off Valve CHECK SHEET—also new YARWAY Blow-Off Valve Catalog B-426 (pressures to 400 psi) or B-434 for higher pressures.

YARNALL-WARING COMPANY
145 Mermaid Avenue, Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES



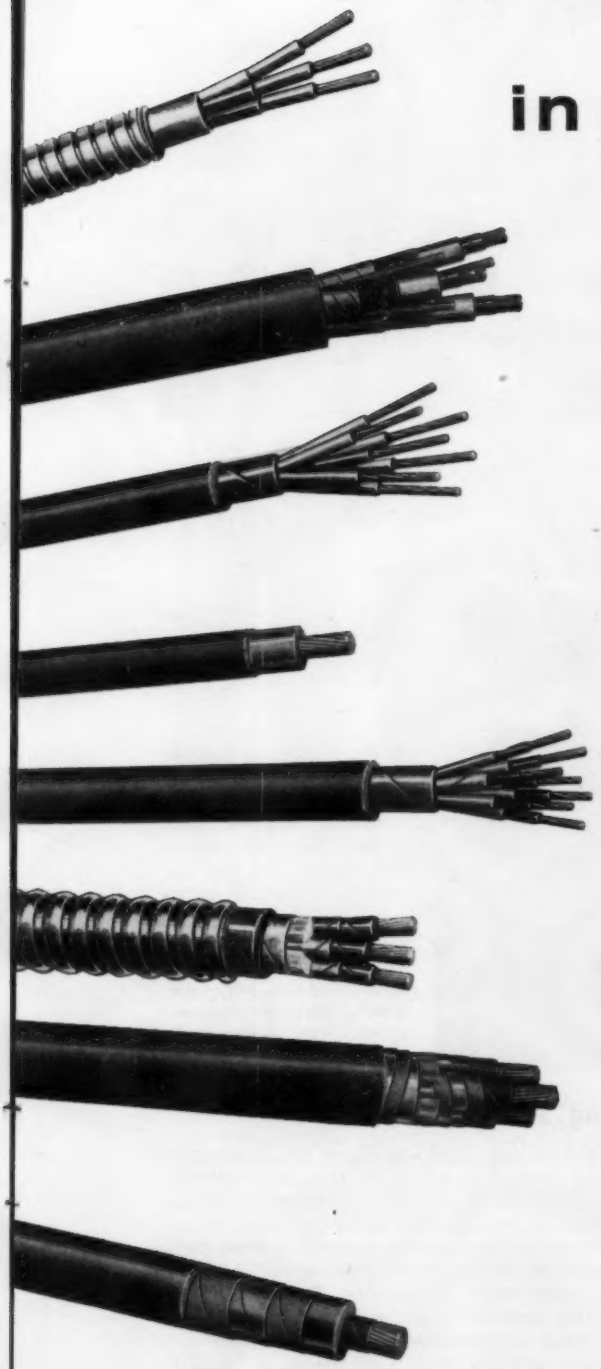
Cross-section of Yarway Seatless valve for low and medium pressures. Features balanced nitralloy plunger that seals drop tight—yet permits free, unobstructed flow in blow-down. There is no seat to score, wear, clog or leak. **Used in over 15,000 boiler plants.**

YARWAY blow-off valves

For more facts circle 573 on Reply Card

For a given application, there are usually one or more cables that may fill the need. And from General Electric's comprehensive line you can select the one cable that will hit the bull's-eye for you.

The importance of accuracy in cable selection



Today, selection of the best wires and cables for your particular needs demands that a wide variety of factors be considered, ranging from standard requirements such as flame-resistance, heat-, moisture-, and weather-resistance—to special constructions which withstand vibration, the electromagnetic effects of adjacent power cables—even the effects of atomic radiation.

General Electric has developed hundreds of cables for just about every possible application. Thus, General Electric engineers are never limited to one wire or cable for a given job but can suggest the most efficient and economical solution for the particular situation.

This is one of the important reasons why many electric utilities and industrial plants work with General Electric wire and cable engineers in planning their electrical expansion and modernization programs. Another reason is General Electric's knowledge of the requirements of other basic components of power distribution systems—transformers, load centers, switchgear, etc.—the knowledge that the right cable plays an important part in satisfactory system performance.

All this adds up to experience that can benefit you. Take advantage of it the next time you have a cable selection problem. For information on your specific wire and cable application or selection problem, see the G-E wire and cable specialist in your locality or write Section W197-664, Wire and Cable Department, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 574 on Reply Card

Chemicals from Coke Put Steel Industry into the Chemical Field

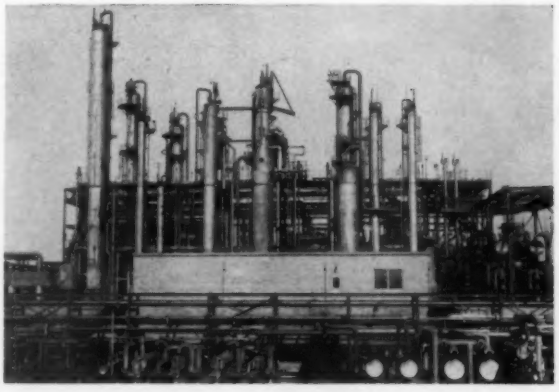
STEEL AND CHEMISTRY are partners in one of the most vital undertakings of the 20th century—the development of coal chemicals. A ton and a half of coal slow baked in an oven yields a ton of coke; the other half-ton escaped up the chimney as black smoke and gas.

The steel industry, responsible for about 90 per cent of the coke produced in America, is harvesting these gases and the valuable coal chemicals they contain. U. S. Steel, for instance, operates ten coal chemical plants across the nation, producing more than one million tons of coal chemicals each year.

The average yield from a ton of coking coal is about 145 lb of chemicals, and the Gary, Indiana coke ovens alone consume about 21,000 tons of coal a day.

Coal chemicals are divided into three main classes: light oils, nitrogen products and tar products. The principal light oils are benzene, toluene, xylene, the solvent naphthas, and other crude fractions. The nitrogen produced at Gary is in the form of ammonium sulfate.

The coke and coal chemicals division of Gary Steel Works produces these chemicals in large quantities. Of

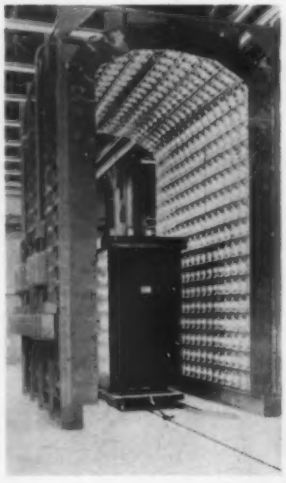


the tar group, the principal product is naphthalene. Other products of the tar group are phenol, cresols, xylenols, cresylic acids, pyridine, creosote oil and the picolines.

Infrared Paint "Bakery"

PAINT IS BAKED on 12-ft high capacitor housings at General Electric's Hudson Falls, N.Y., plant by conveying the housings through infrared ovens. The Fostoria Pressed Steel Corp. ovens, approximately 15 ft long and 17 ft high, are designed to utilize banks of GE infrared lamps developing 300 F heat for the 30-minute bake.

Electrically, the oven is divided into several circuits so that parts of it may be turned off when smaller housings are being baked.



Complex Geiger Counter

A RADIATION monitoring system for the nation's first nuclear power plant, being built by Duquesne Light Co. and the AEC, will prevent harmful radioactive material entering the atmosphere at the Shippingport, Pa. plant site.

Built by Westinghouse's X-Ray Div., the system will check (and use Assembly Products meter-relays to actuate any necessary alarms): leakage in the reactor's cooling system, radiation accumulation in the boiler compartments, contamination in ventilating and cooling air.

Aluminum Plate "Takes the Cure" in Stress-Relieving Stretcher

ABLE TO STRETCH an aluminum plate up to six inches thick, up to 90 ft long and up to 12 ft wide, the world's largest "stretcher" is in operation at the Reynolds Metals plant in McCook, Illinois.

In literally stretching aluminum plates, the machine can exert a pulling force of 16 million lb. It requires only one man for its operation in stretching aluminum to release internal stresses set up in rolling and heat-treating.

Plates stretched by the machine are used to form large wing structures for the mightiest airplanes yet developed. Culminating three years of planning, development and construction, the stretcher is producing wing surfaces for every major plane manufacturer in the United States.

The monster, weighing over 4,400,000 lb, is 182½ ft long; 29 ft wide; 21 ft 6 in. high from its base. Two-thirds of its mass is below the floor line. Special foundations incorporating unique methods of obtaining resiliency are necessary to permit the tensions exerted in stretching the plate. The two gripper-heads which hold the aluminum plate while it is being stretched weigh over one-half million lb apiece.

The stretcher is one of a complex of newly developed tools, fully integrated into McCook's in-line production.

SOLUTION . . . IN SECONDS

Your preventive maintenance specialist specifies a certain size and type of Whitney chain for immediate replacement on a vital production machine. He knows that Whitney Chain will do the job more efficiently and dependably . . . plus an often vital factor—"no lost time" in obtaining the particular chain or part needed.

A phone call to your Whitney Distributor means fast, off-the-shelf service, saving your production time and money. And Whitney's latest chain design advancements can contribute still more to your plant's efficiency.

For example, Whitney's Self-Lubricating Single and Double Pitch Roller Chains outlast regular chains as much as 5 to 1 under rugged field conditions of dust or moisture. They also help eliminate product contamination and spoilage on equipment where normal external lubrication cannot be applied. These benefits result from Whitney's exclusive sintered steel chain bushings which "oil from the inside" . . . are prelubricated for life.

And Whitney's *fatigue resistant* Processed Roller Chain is establishing new service standards for durability, particularly on problem drives involving unusual operational conditions, stresses and heavy shock loads. This performance comes from the exclusive Whitney process which offsets excessive operational stresses in the chain.

Whenever you need power transmission or conveying chain drives, your alert Whitney Distributor is always ready with a complete line of A.S.A. Chains and Sprockets. His service is backed up by Whitney Field Engineering Offices and Warehouses across the country.

Whitney helps you keep ahead of competition.

Whitney
CHAIN COMPANY

232 HAMILTON ST., HARTFORD 2, CONN.

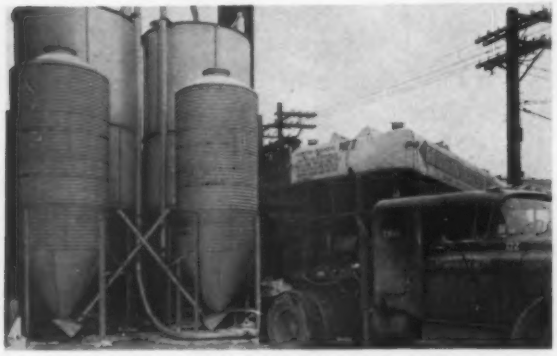
ROLLER CHAIN • SILENT CHAIN • CONVEYOR CHAIN • SPROCKETS • FLEXIBLE COUPLINGS

For more facts circle 575 on Reply Card

Plastics Shipped in Bulk to User Plant, Via Trailer Truck

TAKING ADVANTAGE of bulk shipment of Tenite plastics, Flex-O-Glass, Inc., of Chicago, has been able to substantially reduce materials handling cost.

Under the plan, Tenite plastics products of Eastman Chemical Products, Inc., are shipped by trailer truck, in airtight compartments. Arriving at the customer's plant, they are "airveyed" from trailer to storage tanks or silos by utilizing a self-contained 25-hp blower mounted on the forward end of the trailer.



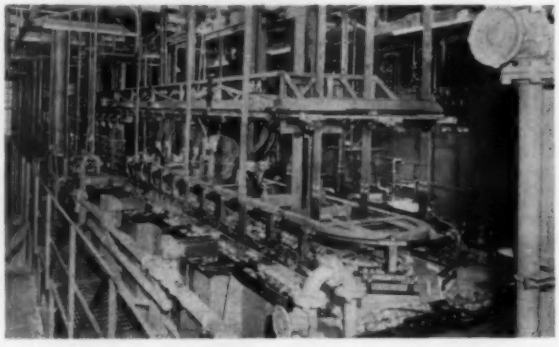
Unloading is accomplished through 40 ft of flexible hose, 6 in. in diam. Two 20-ft sections of the hose are carried on the truck and can be quickly connected to the customer's filling line by means of a spring-loaded ratchet. To receive the materials, Flex-O-Glass employs two aluminum silos, each with a capacity of 35,000 lb. Later, materials are transferred direct from silos to processing equipment by means of electric-powered screw conveyors.

Cost reductions made possible by bulk handling are attributable to several factors. First, the labor and equipment required to unload shipments of other types are eliminated. After the hose connections are made, unloading is accomplished practically unattended. Second, the use of large silos, tanks, or bins minimizes the storage area required. And third, the concentrated storage facilitates transfer of material to processing machinery by air, gravity, or mechanical means.

Automatic Finishing for Die Castings Goes into High Speed

PRECISION CASTINGS, a division of Harsco Corp., has just completed a series of highly integrated, automatic finishing departments for die castings. These new facilities, costing more than $500,000, include automatic equipment for cleaning, copper-nickel and chrome or brass plating, phosphate coating, spray painting, baking and polishing.

Special features of the facilities include: 1. extended automatic cleaning in a multi-station cleaning cycle, more extensive than that previously used by the industry; 2. flexible automatic plating, offering increased speed of metal deposition and improved labor-control techniques. (A special feature permits removal of racks after nickel plating for transfer to a special bright brass plating line, if desired); 3. conveyorized automatic polishing, with automatic application of buffing compound as well as latest design for flexibility in handling parts of various size and shape; and 4. combination radiation-convection oven that provides an equivalent 30-minute bake for parts after only 20 minutes in the oven. Calrod tubes in the early portion of the oven cycle bring parts up to heat quickly, so no time is wasted in overcoming ambient temperature.



Tents of Tarpaulins Enclose Concrete Girders for Curing

THREE HUNDRED FIFTY canvas tarpaulins enabled a contractor to keep "full speed ahead" during bad weather on the erection of post-tensioned concrete girders and beams for three large buildings of the new plant of the Electric Typewriter Div. of IBM of Lexington, Kentucky.

The prime contractor on the job used the 350 tarps to speed the curing of the huge post-tensioned concrete beams and girders. The tarps were fastened together to form a mammoth canvas cover over a framework of lumber. Then, hot air was blown into the enclosure, giving a uniform and certain method of insuring that the concrete would cure properly. The air was blown over each newly-poured unit for a seven day period.

The use of tarpaulins in accelerating the curing process as demonstrated on the IBM job in Kentucky adds another bit of evidence that post-tensioned concrete building members can be erected in almost any kind of weather, if proper techniques and precautions are followed.

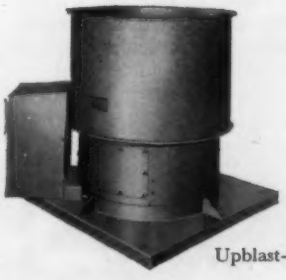
In planning their winter weather construction job, the contractor selected 20 x 20 canvas tarpaulins, 12 oz. weight, manufactured by the Hoosier Tarpaulin and Canvas Goods Co. of Indianapolis.

More than 20,000 cu yd of concrete were used in pouring the pre-stressed concrete members.

FROM SPOT VENTILATION . . . TO LARGE-AREA SYSTEMS

. . . independent, roof-mounted units offer balanced ventilation, plant-design flexibility!

Hood-type for supply or exhaust duty



Upblast-type Exhaust Ventilator

Right in step with the trend to modern plant design, economical American Blower Power Roof Ventilators provide flexible ventilation to fit changing industrial needs. Each unit is individually operated and may be relocated, or additional units may be added, if buildings are changed or enlarged. Roof-mounted, they do not take up valuable floor space, nor does extensive ductwork interfere with overhead crane-ways. And being power operated, they may be located without regard to wind direction or temperature differentials.

Two types of American Blower exhaust and supply Power Roof Ventilators are available: hood-type and upblast-type. For full details, call your nearest American Blower Branch Office; or write: American Blower Division of American-Standard, Detroit 32, Mich. In Canada: Canadian Sirocco products, Windsor, Ont.

AMERICAN BLOWER

Division of AMERICAN-Standard

For more facts circle 576 on Reply Card

What one form of power is cheaper today than in 1940?

Electricity. And if you operate electric industrial trucks, the cost is probably less now than when you bought them.

Isn't this a refreshing contrast to the rest of today's business-cost picture? And isn't this something to think about for the future? Other costs keep going up, up, up. But electricity has been coming down, down, down—for years.

The result is that electric industrial trucks are a better power bargain today than they've ever been. And power savings plus overhead savings actually total hundreds of dollars per truck every year. This has been proved in thousands of cases in all types of truck service.

Here's how you save: You buy the power from your local electric company at low rates. Heavy duty storage batteries last for years without replacement. Cool-running electric motor-drive systems that seldom need maintenance—use no power at all when standing still. While first cost is higher, electric industrial trucks give you more than twice the useful life, according to national average figures. And it's a fact that of all the electric industrial trucks ever made in the U.S., about 90% are still on the job! That's real proof of service.

These are important cost considerations for up-to-date management men today. In addition, electric industrial trucks are easier to operate and make practically no noise—advantages especially appreciated by plant personnel. Have a talk with your nearby industrial truck dealer or salesman. He's listed in your classified telephone directory under "Trucks—industrial."

This message is presented as a service to industry by Exide Industrial Division, The Electric Storage Battery Company, Phila. 2, Pa.

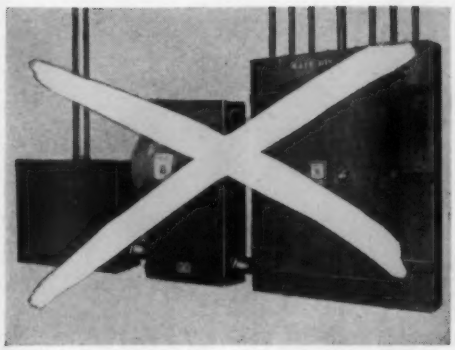
THE ELECTRIC STORAGE BATTERY COMPANY **Exide®**

For more facts circle 727 on Reply Card

THIS NEW *POWER-STYLE* SWITCHBOARD

TAKES LESS SPACE and COSTS LESS, TOO!

above • **the modern way.** C/T compartment and six distribution branches are combined in a single cubicle with all inter-connections bussed. Because installation time and costs are cut so drastically, this new way actually costs less than the old!



above • the old way of installing service entrance—a C/T cabinet, a large safety switch and a panel board or a gang of smaller safety switches were hung on a wall and connected by a complicated arrangement of wireway or conduit and cable. Expensive, space-consuming and unsightly.

POWER-STYLE FEATURES

- Only 14 inches deep and 30″ or 36″ wide... saves valuable space!
- Complete front accessibility—connect all circuits from the front!
- Standardized C/T compartment meets Edison Electric Institute and Public Utilities' specifications.
- Service sections are also available with a main switch or main breaker...arranged for either hot or cold sequence.

Write for Layout and Specification Manual...a valuable source of reference. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY

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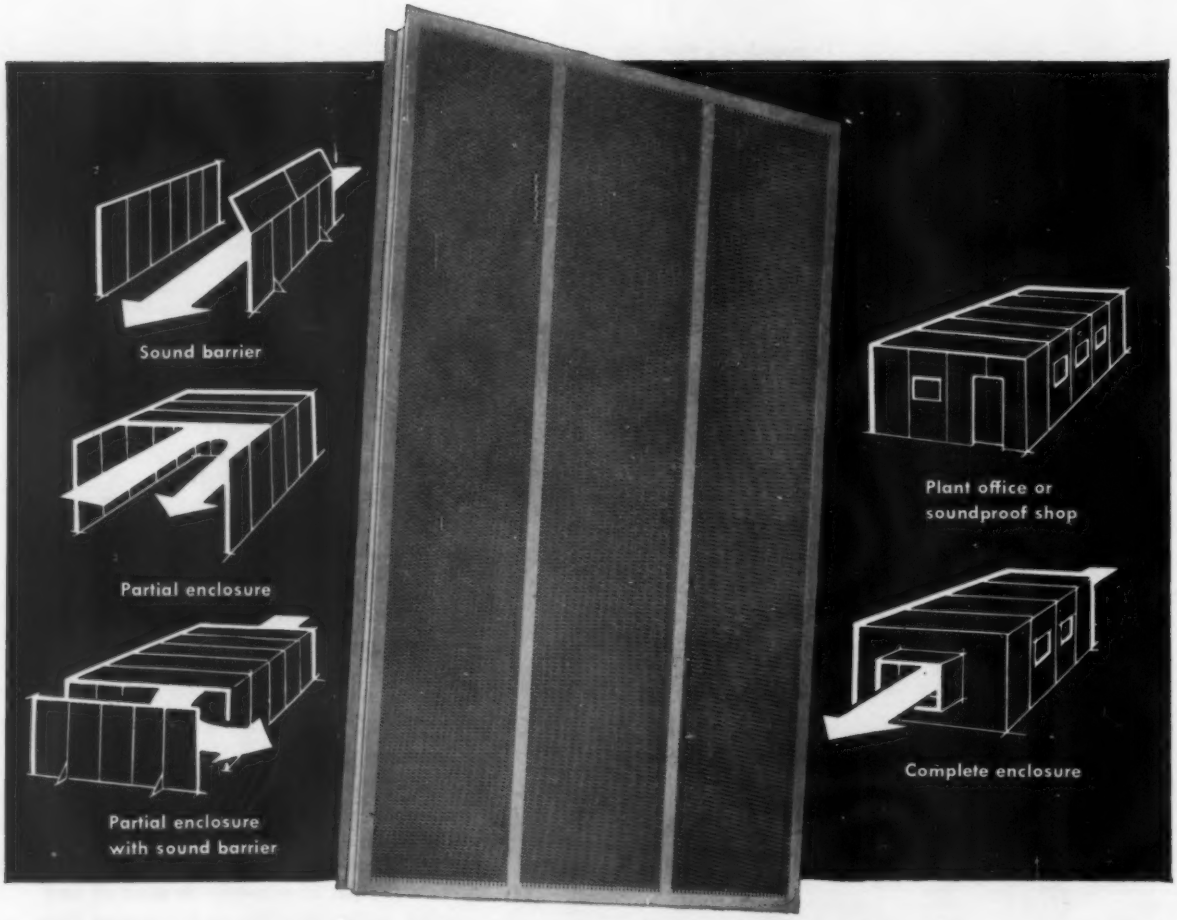


How to get rid of an unseen production cost!

Attacking plant noises at their sources with SOUNDMETAL* panels, made by Koppers, increases worker efficiency, prevents costly physical and psychological injuries, and improves community relations.

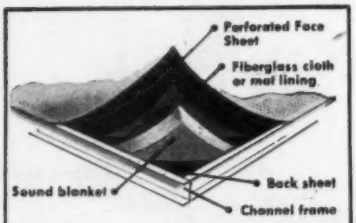
You're paying for noise even though it doesn't show in your cost accounting. Noise slows down output by distracting and irritating your employees. It interrupts communications. It confuses operations. It causes hearing loss. *It costs money.*

But you can prevent such needless expenditures by installing SOUNDMETAL panels, made by the Industrial Sound Control Department of Koppers Company, Inc. With SOUNDMETAL panels, you can enclose the noise source itself with partial or complete machinery enclosures, sound barriers, soundproof rooms or other types of sound control devices. Or you can enclose the personnel affected in rooms or booths of your own design. SOUNDFRAME* windows and SOUNDMETAL doors provide for light, vision and access; but they prevent the passage of sound.

And you further economize by using your own labor force to install SOUNDMETAL panels. They're easily assembled and disassembled . . . quickly moved from one location or application to another.

For more details on how you can enjoy continuous, effective sound control with a minimum investment, write to: KOPPERS COMPANY, INC., Industrial Sound Control Dept., 7506 Scott St., Baltimore 3, Md.

*Koppers Trademark



There are 5 types of SOUNDMETAL panels available — designed by Koppers engineers, experienced in silencing jet engines and air conditioning systems.

KOPPERS

INDUSTRIAL SOUND CONTROL EQUIPMENT

Engineered Products Sold with *Service*

For more facts circle 578 on Reply Card

Sylvania's R-52 lamp has a sealed-in reflector that never dims . . . produces more light where you want it . . . makes costly fixture care unnecessary.

All downward **working** light—no upward **wasted** light . . . with this Sylvania reflector lamp

Sylvania's R-52 reflector lamp has helped industrial plant management to effect important lighting economies, and achieve greater lighting efficiency.

The R-52 reflector lamp is a "high-bay" lamp particularly suited to overcome plant conditions of severe dirt, grease and smoke. Its *sealed-in aluminized* reflector is 100% dirt-proof . . . eliminates the need for costly, time-consuming fixture-cleaning . . . and provides greater efficiency throughout the life of the lamp.

As an integral part of the Sylvania R-52, the reflector is angled to concentrate a maximum of usable working light downward . . . helps increase productive efficiency . . . and provides more useful light for the same wattage.

R-52 reflector lamps are available in 500- and 750-watt sizes. Your Sylvania Supplier will gladly demonstrate their efficiency and advantages. Call him for complete information, or write:

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, Dept. 7L-7006
60 Boston Street, Salem, Mass.

In Canada:
Sylvania Electric (Canada) Ltd.
Shell Tower Building, Montreal

SYLVANIA

. . . the fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

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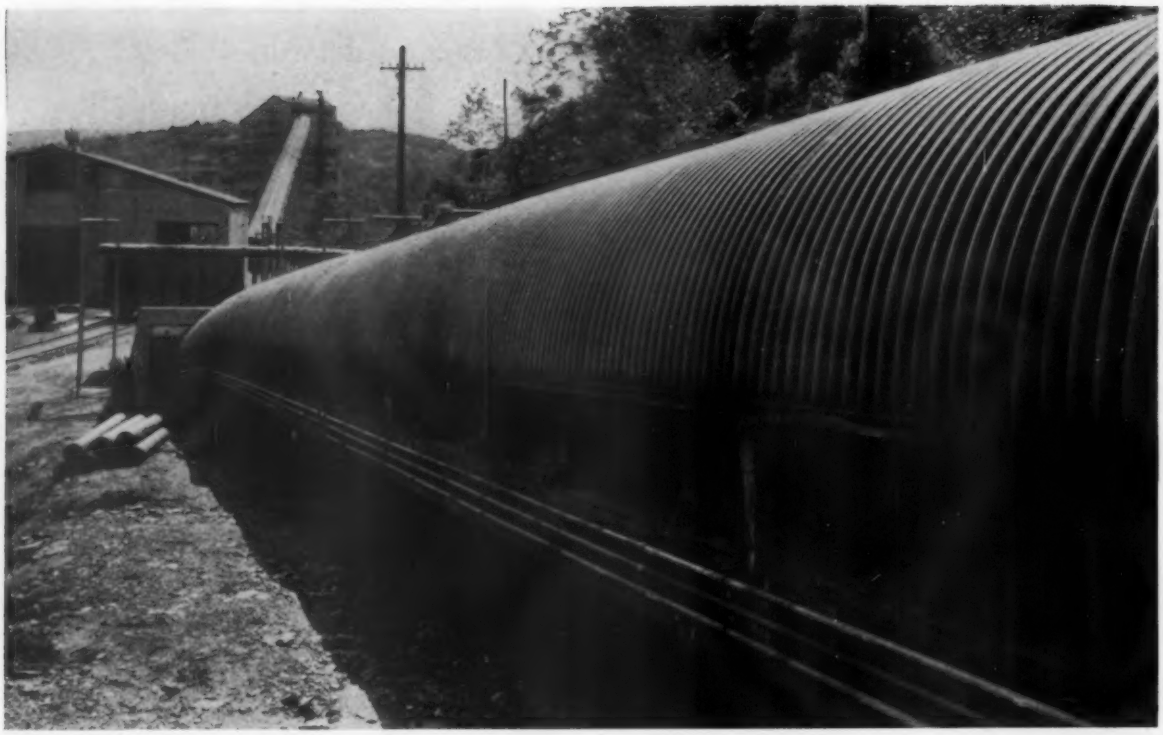

OVER 25 YEARS AT HARD LABOR AND STILL GOING STRONG!

Exposure to rigorous weather and a corrosive atmosphere for more than 25 years has deposited a film of dirt on this conveyer cover. But underneath, the Alcoa® Aluminum Curved Corrugated Sheet is in perfect condition. The Philadelphia & Reading Coal & Iron Company selected aluminum for this conveyer cover at its St. Nicholas Central Breaker, Schuylkill County, Pa., because of unsatisfactory experience with other materials.

While other covering materials could have been purchased at slightly lower cost back in 1932, the owners are many dollars ahead now. Savings in maintenance and added life made aluminum the most economical buy by far.

Alcoa Aluminum Curved Corrugated Sheet is just one in Alcoa's complete line of Industrial Building Products for modern plant construction. They include V-Beam, Ribbed and Corrugated Sheets. All are now available in a new sea-green finish called Architectural Alodine*.

Complete information on the uses of Alcoa Aluminum in industrial building and on the expert installation services of Alcoa Approved Applicators is available to you at no obligation. Just call your nearest Alcoa sales office or write Aluminum Company of America, 858-F Alcoa Building, Pittsburgh 19, Pennsylvania.

*Registered Trademark of American Chemical Paint Company

FREE COLOR SAMPLE!

New Architectural Alodine Green Finish

This new green finish is chemically a part of the metal itself. Available on all Alcoa Aluminum Industrial Building Products, this new color will enhance the appearance of any industrial installation. For a free sample, write to the box number listed below left.

ALCOA ALUMINUM
INDUSTRIAL BUILDING PRODUCTS
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

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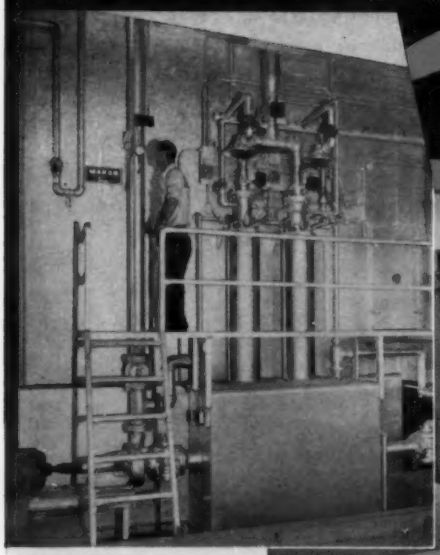
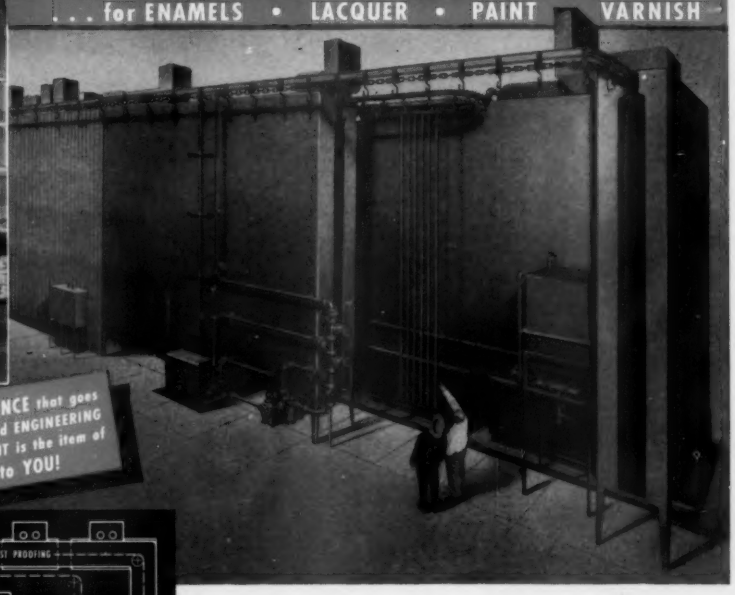
COMPLETE *Finishing* SYSTEMS

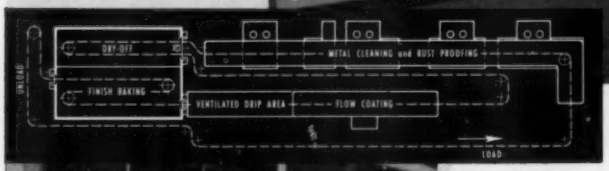
. . . for ENAMELS • LACQUER • PAINT VARNISH

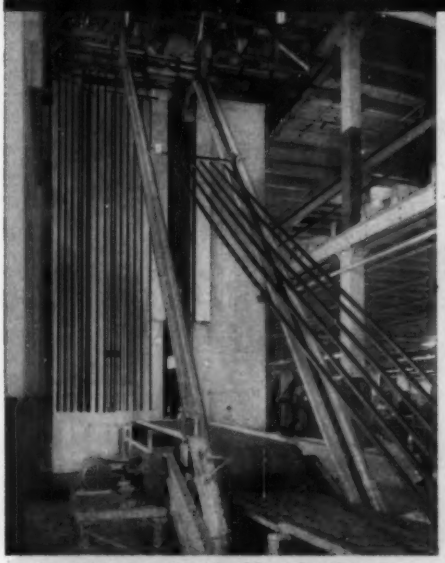


Mahon FIRE-JET Heating Units on the solution tanks of Mahon Five-Stage Metal Cleaning and Rust Proofing Machine—part of the Complete Mahon Finishing System at MULT-A-FRAME Division of Ainsworth Manufacturing Corporation, Detroit, Mich.



. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!





Exit end of Mahon combined Dry-Off and Finish Baking Oven showing Automatic Unloading Conveyor Ramp and Belt Type Handling Conveyors on the first floor at the Ainsworth Plant.

Ainsworth MULT-A-FRAME Channels are Painted in MAHON EQUIPMENT!

When the MULT-A-FRAME Division of Ainsworth Manufacturing Corporation was confronted with a finishing problem, they turned to Mahon for the solution. The product is a box channel 20 ft. long with only a ½" slot in one side—these are cleaned, rust proofed and painted outside and inside. Two hundred channels are finished per hour. Thousands of Fittings, Concrete Inserts and other MULT-A-FRAME parts and accessories are also finished on the same line. The finishing equipment extends from a pit in the first floor to the second floor ceiling. Oven Heating Units, Recirculating Fans and Exhaust Fans are located on the third floor. Automatic loaders and unloaders, with ramp conveyors from the first floor, load and unload the main conveyor which is located 27'-5" above the first floor. This is another Complete Mahon Finishing System designed and built by Mahon to do a specific job efficiently and economically. If you have a finishing problem, or are contemplating new finishing equipment, you will find that Mahon engineers are better qualified to advise you on both methods and equipment requirements . . . better qualified to do the all-important planning and engineering of equipment—which is the key to fine finishes at minimum cost. You will also find that Mahon equipment is built better for more economical operation over a longer period of time. Mahon's background history in this highly specialized field covers thousands of Complete Finishing Systems including Dip, Flow Coating and Spray Equipment for every conceivable product painted on a production basis. See Sweet's Plant Engineering File, or write for Catalog A-657.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

MAHON

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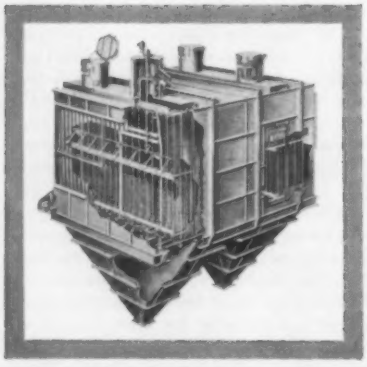
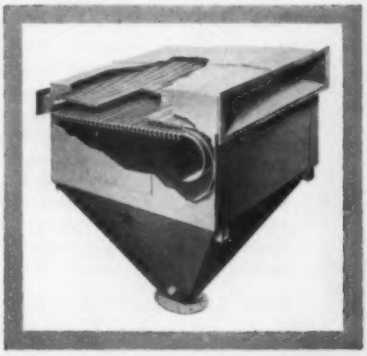
How Buell's exclusive Shave-off pays off in extra dust collection efficiency



Buell SF Electric Precipitator also delivers extra dust collection efficiency, due to unique Spiralectrodes and Continuous Cycle Rapping.

Proper proportioning, side entry of dust-laden gases, add even more extra efficiency and long, maintenance-free life to Buell Cyclones. Large diameter design eliminates bridging and clogging, keeps efficiency high under varying loads.



Buell Low Resistance Fly Ash Collector combines top efficiency with low draft loss, for either natural or mechanical draft installations.

For more specific data about Buell's *extra efficiency*, write Dept. 14-F
Buell Engineering Company,
70 Pine Street,
New York 5, N. Y.

buell®

MECHANICAL ELECTRICAL *Experts at delivering Extra Efficiency in* **DUST COLLECTION SYSTEMS**

For more facts circle 582 on Reply Card

For more facts circle 583 on Reply Card →

Multigrip Floor Plate...

structural strength plus safe footing on coke recovery lines

Through these huge recovery mains pour millions of cubic feet of coke-oven gas and tars, on the way to becoming myriad by-products. On top of the lines (surfaced with USS Multigrip Floor Plate) are spooning holes and liquor-flushing connections to clean the lines. **Safe Footing.** Plant workmen must walk on top of the lines, stepping over and around fittings. One slip could mean a serious accident. Here Multigrip performs an important safety job every time a worker puts his foot down. Evenly spaced, flat-topped risers with clean edges afford traction from *any* direction, even when the plates are wet. Multigrip wears indefinitely without chipping, cracking or splintering. And it's available in large plates that eliminate installation waste. For safety, for long wear, for easy installation . . . specify USS Multigrip Floor Plate.

Multigrip can be cut, welded or formed where necessary.

Flat-topped, evenly spaced risers on Multigrip provide safe footing for workmen.

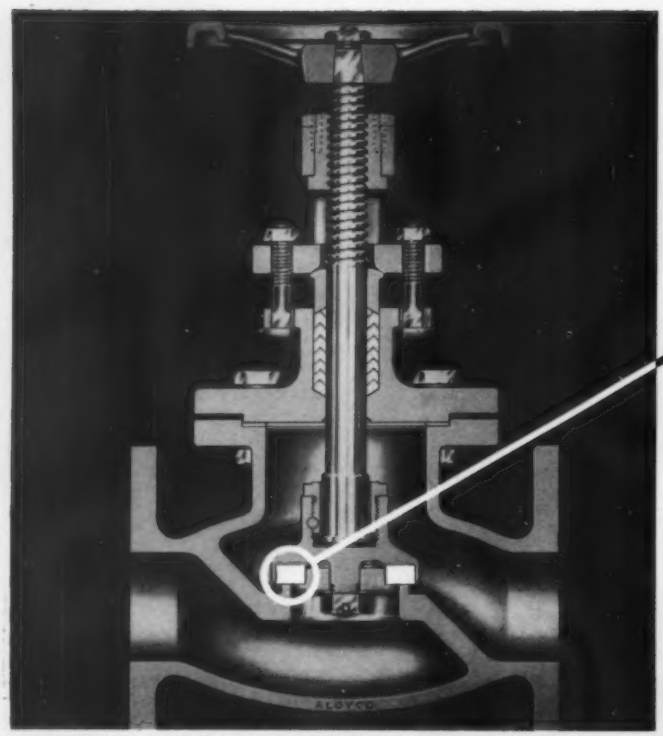
This 140-ton coke-oven gas collecting main, built by Jennings Mfg. Co., Masury, Ohio, is constructed of USS Structural Steel with a walkway of USS Multigrip Floor Plate.

UNITED STATES STEEL CORPORATION, PITTSBURGH
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, CHICAGO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

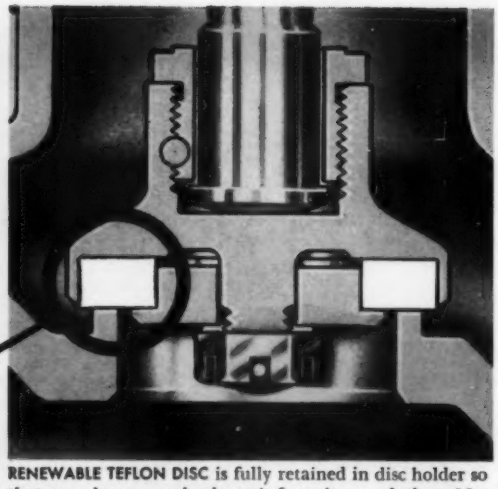
USS **multigrip**
FLOOR PLATE

Sold by leading distributors from coast to coast

UNITED STATES STEEL



150 LB. ALOYCO GLOBE VALVE features bolted bonnet, and outside screw and yoke construction which keeps stem threads out of contact with corrosive fluids. Two piece gland plates and followers. Sound, heavy section body and bonnet castings. Stainless bolts. Heavy finished stem. Renewable yoke bushing. Flanged or screwed ends.



RENEWABLE TEFLON DISC is fully retained in disc holder so that even heavy overloads can't force it out of place. Machined seating surface assures wide full contact with disc and protects against distortion. Teflon V-type chevron packing rings are also used in deep stuffing box.

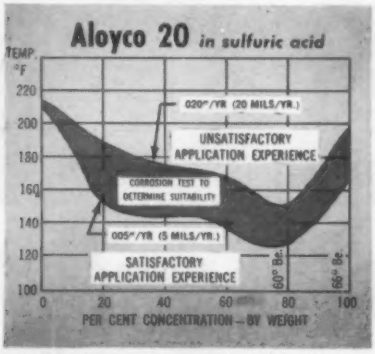
Tips on selecting valves to combat oxidizing solutions

High chromium and chromium-nickel stainless steels are the best alloys for these corrosive applications.

When exposed to oxidizing solutions they form protective films which restrain corrosive attack. Aloyco 18-8S, 18-8S mo and Aloyco 20 are good examples.

Valves should be constructed so that slight wear or corrosion won't require costly valve replacement. Renewable seats or discs shown above are one answer to this problem. So are deep stuffing boxes and outside screw and yoke construction. And, of course, all valve parts that come in contact with the corrosive fluid should be alloy steels. 4.18

ALOYCO STAINLESS STEEL 18-8S (type 304) is expressly suited for resistance to oxidizing solutions. It also lends itself to innumerable other applications to prevent product contamination or discoloration. In Aloyco 18-8S mo (type 316), molybdenum is added to increase resistance to attack by pitting.



ALOYCO 20 provides a high order of corrosion resistance to a wide range of sulfuric acid concentrations at varied temperatures as indicated by the graph above.

ALOYCO TECHNICAL SERVICE includes engineering counsel, metallurgical assistance and field service. Samples are being prepared for plant line test above.

For more facts circle 584 on Reply Card

FOR FURTHER INFORMATION on Aloyco corrosion-resistant valves, write to Alloy Steel Products Company, 1308 West Elizabeth Avenue, Linden, New Jersey.

What Rust-Oleum has saved for others is not half so important as the money it can save for YOU...

TRY RUST-OLEUM®

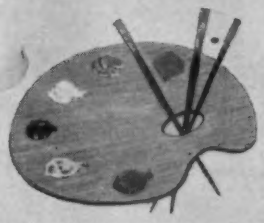
on your rustable metal surfaces under your own conditions

You've got to *try* Rust-Oleum *yourself* to get the feel of it . . . to see how *fast* it covers, how *easy* it works, how smoothly it flows on. You'll see the *big* savings in time, labor and money when you apply Rust-Oleum 769 Damp-Proof Red Primer over rusted metal—eliminating costly surface preparations. You'll see how the *specially-processed* fish oil vehicle *penetrates* rust to bare metal where it stops rust to assure long wear. You'll say you've never used a coating that went on so easily and covered so well. Try Rust-Oleum *soon*—in your plant or around your home. Write for illustrated literature with color charts.

Rust-Oleum Corporation, 2607 Oakton St., Evanston, Ill.

APPLY DIRECTLY OVER SOUND RUSTED METAL

No costly surface preparations usually required—just scrape and wire-brush to remove rust scale and loose rust—then brush Rust-Oleum 769 Damp-Proof Red Primer right over the remaining rust.



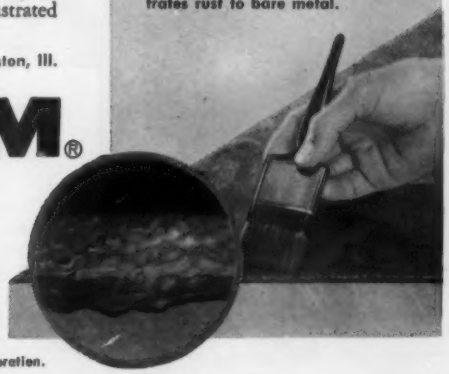
MANY ATTRACTIVE COLORS TO BEAUTIFY AS YOU PROTECT

Colors, colors, colors—they're yours in many attractive Rust-Oleum finish coatings—including Aluminum, White, Red, Gray, Green, Blue, Yellow, Black and many more.

DISTINCTIVE AS YOUR OWN FINGERPRINT

Rust-Oleum is *exclusive*—with a specially-processed fish oil vehicle in both primers and finish coatings. Accept no substitute. Prompt delivery from Industrial Distributor stocks.

Write for special thirty-page report showing how Rust-Oleum penetrates rust to bare metal.



RUST-OLEUM® STOPS RUST!®

Rust-Oleum and Stops Rust are brand names and registered trademarks of the Rust-Oleum Corporation.

For more facts circle 585 on Reply Card

YOU'RE DOUBLY SURE

of complete fuse protection with

ECONOMY fuses!

ECON® DUAL-ELEMENT CARTRIDGE FUSES

with exclusive Econ Alloy Thermo Element. Ideal for motor circuits with high starting torques. Knife blade or ferrule types, sizes from 2" to 13⅞" and capacities to 600 amps for both 250 volts and 600 volts.

ECO® ONE-TIME CARTRIDGE FUSES

provide unexcelled uniformity of current-time operation. Available in both knife blade and ferrule types, sizes from 2" to 13⅞" and capacities up to 600 amps for both 250 volts and 600 volts.

ARKLESS® MECHANICAL INDICATING FUSES

are recommended where positive indication is required. Guaranteed 100% to indicate. Knife blade or ferrule types, sizes from 2" to 13⅞", capacities to 600 amps in both 250 volts and 600 volts.

DELAY® RENEWABLE CARTRIDGE FUSES

offer superior protection for branch and feeder lines. Can be restored to original efficiency in a few minutes for a few cents. Knife blade or ferrule types, sizes from 2" to 13⅜", capacities to 600 amps, 250 volts and 600 volts.

ECONOMY RENEWABLE PLUG FUSES

offer low-cost replacement in circuits where repeat blows are experienced. Can be restored to original efficiency in minutes. Available in standard and sub-standard sizes, 10 to 30 amps capacities for 125 volts.

CLEARSITE® PLUG FUSES

are standard for protection in any 125 volt line. They feature a transparent window that shows when and why it blows. Available in both standard and sub-standard sizes, capacities from 10 to 30 amps.

Economy Gives Both—Complete Line Selection plus Creative Engineering!

You're sure of complete fuse protection because Economy's line is complete! It offers you *exactly* the type size and capacity of fusing that is engineered to your specific requirements. Illustrated are some of the popular Economy Fuses that meet definite needs. Economy fuses are the simplest, most practical method of reducing down-time due to needless blows and burnout. Proper selection means fewer replacements, lower-cost, dependable protection... and often, eliminates the need for expensive circuit breakers.

You're sure of complete fuse protection because each Economy Fuse is backed by nearly fifty years of engineering excellence. Creative engineering by Economy anticipates your every fuse need... as exemplified in the pioneering and perfecting of such notable advances as the first renewable fuse to carry the seal of Underwriters' Laboratories... Arkless Mechanical Indicating and Eco One-Time Fuses... as well as the famous Econ Dual-Element Fuse.

It costs no more to be doubly sure of complete fuse protection. And, Economy Fuses are all backed by the seal of Underwriters' Laboratories. Call your local Economy representative for his recommendations... he can save you time and money.

FREE... the Economy Fuse Folder No. 3 will be sent on request. This handy-sized folder lists nearly 400 different types, sizes and capacities of fuses.

ask your Electrical Wholesaler for Economy Fuses

SINCE 1911

ECONOMY FUSES FOR EVERY PURPOSE

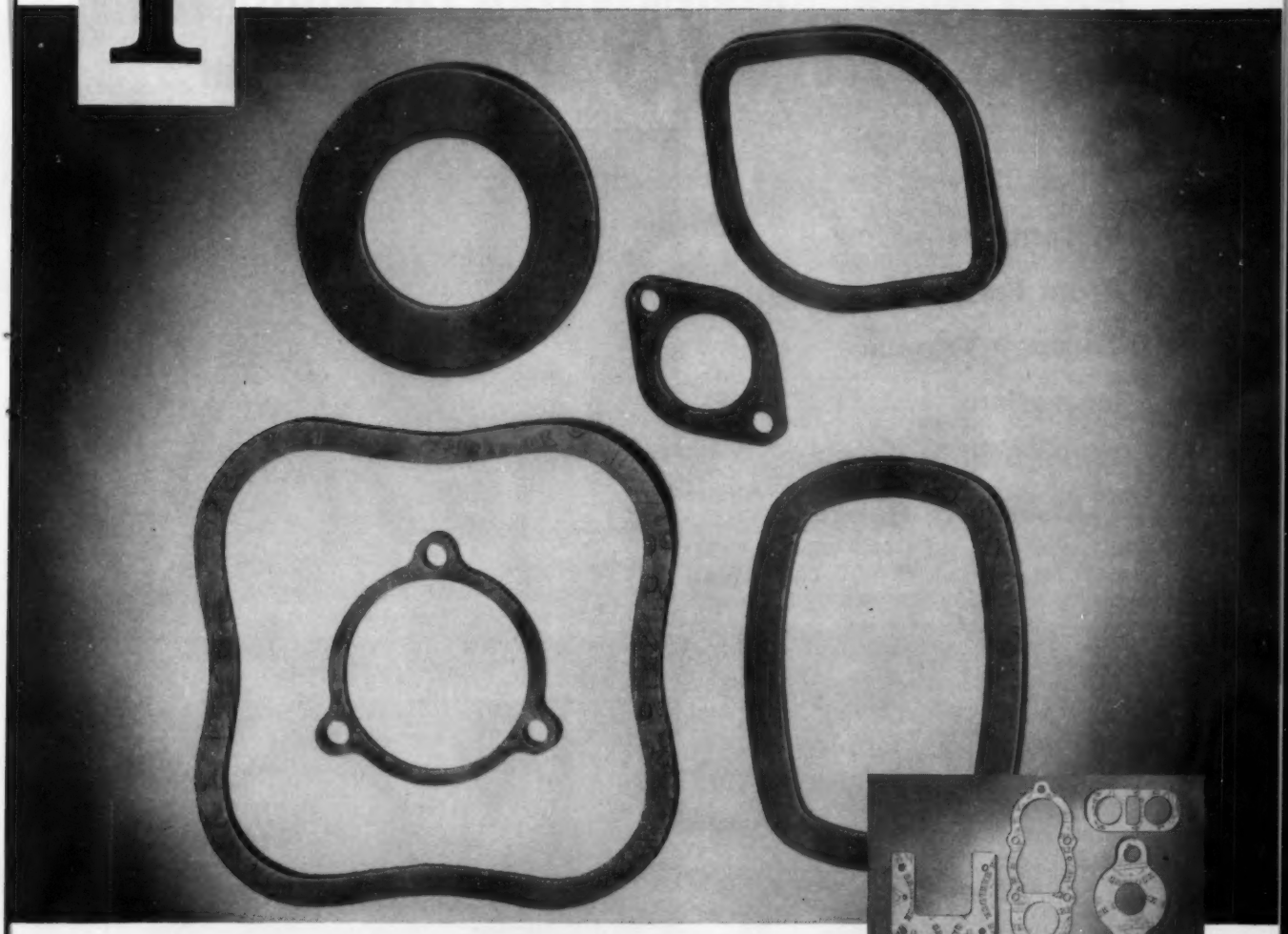
1557

ECONOMY FUSE & MFG. CO., 2717 Greenview Ave., Chicago 14, Ill.

For more facts circle 586 on Reply Card

For more facts circle 587 on Reply Card →

1 GASKET OR 1,000,000

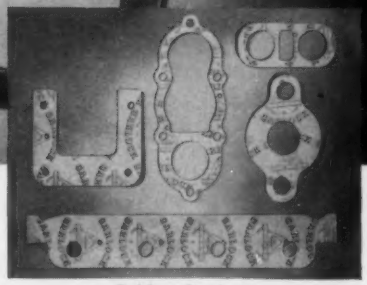


GARLOCK can supply all types of gaskets in any quantity . . .

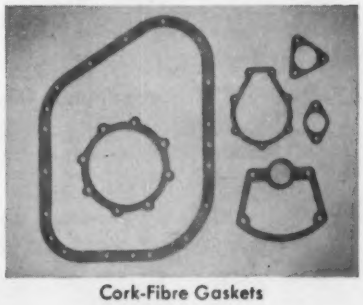
Garlock has the facilities to die cut, hand cut, mold or machine all sizes and shapes of gaskets in any quantity. Yes, whether you are a small or big user, Garlock can supply you with the proper gaskets made accurately to your blueprint specifications or template.

There's a Garlock gasket that answers your every requirement efficiently and economically. Some of the most widely used Garlock gasketing materials are:

- Compressed Asbestos with rubber, neoprene or buna-N binder
- Woven Asbestos
- Rubber—plain, cloth inserted or wire inserted
- Buna-N
- Thiokol—plain or cloth inserted
- Silicone—plain or or cloth inserted
- "Teflon"
- Neoprene—plain or cloth inserted
- Vegetable Fibre
- Cork-Fibre
- Asbestos—metallic
- Leather



Rubber Gaskets



Cork-Fibre Gaskets

Remember

. . . these gaskets are only part of "the Garlock 2,000" . . . two thousand different styles of gaskets, packings and seals to meet all your needs . . . the only complete line available. That's why you get unbiased recommendations from your Garlock representative. Call him today.

THE GARLOCK PACKING COMPANY, Palmyra, New York

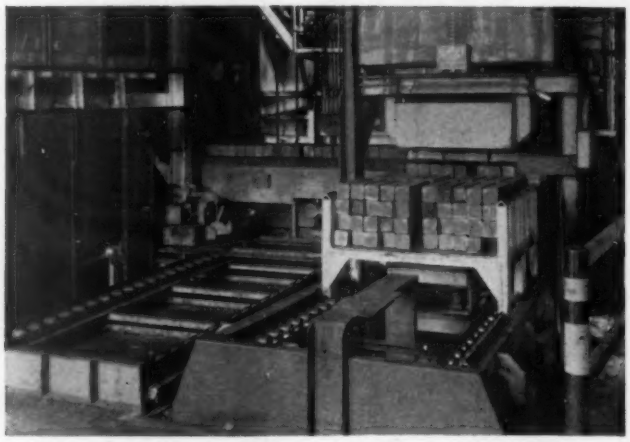
For Prompt Service, *contact one of our 30 sales offices and warehouses throughout the U.S. and Canada.*

GARLOCK

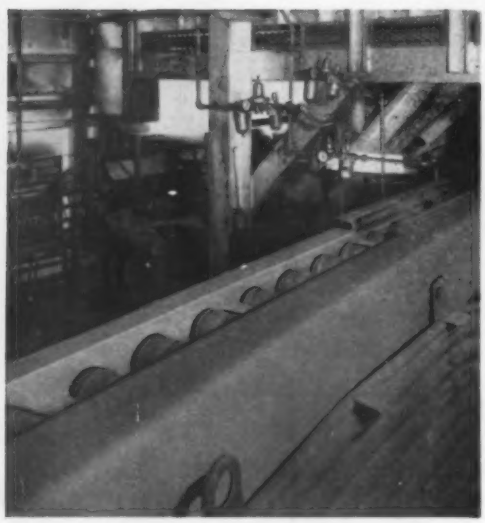
Packings, Gaskets, Oil Seals, Fluorocarbon Products, Mechanical Seals, Rubber Expansion Joints

Hand Handling Eliminated On 6000 Ton Forging Press Line By Planet System

Billets Moved in Continuous Flow From Furnace Through Trimming Operations While Still in Forging Temperature Ranges



In this system, which was recently installed in a large automotive forge plant, a steady flow of billets is insured by the automatic rack unloader. This unit feeds billets automatically into the furnace and moves empty racks away for pick-up.



Hot billets are carried rapidly and in a continuous flow from furnace to the first reducer roll by a powered roller conveyor.

From reducer rolls hot billets are moved to presses, and enroute are turned by roller chain repositioning unit.

Let Planet Help Solve Your Handling Problems — Write or Phone Today
"IT PAYS TO PLAN WITH PLANET"

PLANET CORPORATION

1840 SUNSET AVE., LANSING, MICH.

- **ENGINEERED HANDLING SYSTEMS**
- **AUTOMATED EQUIPMENT**
- **FOUNDRY HANDLING SYSTEMS**

68

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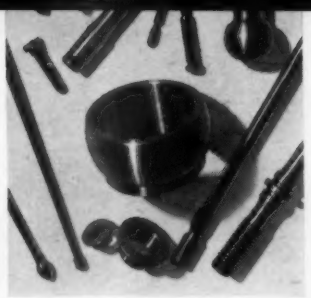
Two case histories

How 2 companies improved production by changing to

STANICUT Cutting Oils



Here are reports on two companies that have recorded (1) increases in production (2) better machine performance (3) longer tool life (4) money saved by switching to a STANICUT *Cutting Oil suited to their operations. You can get similar results.*

Operator George Laverdiere and Standard Oil lubrication engineer, Leland J. Loomis, examine piece just off Cincinnati centerless grinder. Lee Loomis is another man who knows how to advise on metalworking problems. Lee has had ten years' experience in such work, has an engineering degree from Tri-State College and has graduated from the Standard Oil Company's Sales Engineering School.

G. A. Brevik Manufacturing Company uses STANICUT Oil 137 BCS

G. A. Brevik Manufacturing Company, Prescott, Michigan, is the largest producer of carburetor needle valves. The company was blending its cutting fluid from four different oils. Still they experienced tool breakage and ring formation on the surface of the stainless steel they were machining. Then one machine was converted to STANICUT Oil 137 BCS to test the oil's suitability for this operation. Soon all machines were converted.

Production increased 25% because of the improved performance of the machine tool. Cutting oil inventories have been reduced from four different oils to one. Tool life has been extended. There is no variation in fluids as there was when four oils were being blended, and there is no messy blending operation.

STANICUT Oil 137 BCS is ideally suited for severe, high speed machining.

Standard Oil industrial lubrication specialist, Ray Wells, and Stuart Bergsma, G. A. Brevik manager, inspect carburetor needle valve. Ray recommended plant's switch to STANICUT Oil 137 BCS. He is well qualified to make such recommendations. Ray is a graduate of the Illinois Institute of Technology with a degree in engineering, and he has completed the Standard Oil Sales Engineering School. He has been an industrial lubrication specialist at Standard for six years.

Dearborn Centerless Grinding Co. uses STANICUT Oil 126 BCS

Difficult-to-grind stainless steel was the problem at Dearborn Centerless Grinding Company. Wheel loading and wheel break-down were such that soluble type oils weren't satisfactory. For this reason, Dearborn began using STANICUT Oil 126 BCS.

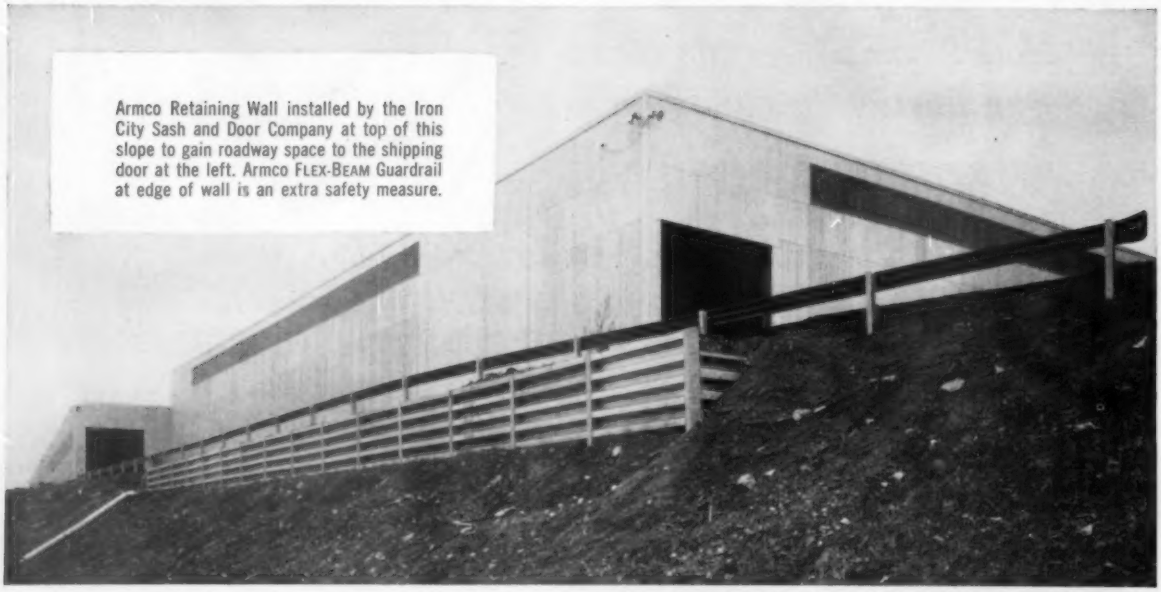
Company management found it secured these six important benefits by changing to STANICUT Oil 126 BCS in grinding operation:

1. Better finishes.
2. More pieces obtained per wheel dress.
3. Superior wheel life obtained on profile jobs.
4. Harder wheels could be used.
5. Finer grit wheels could be used.
6. More stock per pass could be removed.

Get more data on STANICUT Cutting Oils from your Standard Oil industrial lubrication specialist. One of these men is nearby in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD **STANDARD OIL COMPANY**
(Indiana)

For more facts circle 589 on Reply Card



Armco Retaining Wall installed by the Iron City Sash and Door Company at top of this slope to gain roadway space to the shipping door at the left. Armco FLEX-BEAM Guardrail at edge of wall is an extra safety measure.

"An Armco Retaining Wall Cut Our Costs Almost in Half"

So said an official of The Iron City Sash & Door Company, Pittsburgh, Pa., about an Armco Bin-Type Retaining Wall installed on a slope adjacent to the company's new warehouse to provide roadway area.

This was the problem: A shipping dock needed for the warehouse was located along the top of a slope bordering a railroad yard. There was not enough room to assure vehicle safety, so a retaining wall had to be built to provide ample space for trucks. Considered for the job was an Armco Retaining Wall and a conventional type of monolithic wall.

The Armco Wall got the job because, as the company said, "It was about half the cost."

This wall is 150 feet long and 6⅔ feet high. To provide extra safety, Armco FLEX-BEAM® Guardrail has been installed along the edge of the wall.

* * *

All-metal Armco Retaining Walls are composed of deeply corrugated sections. When bolted together, the sections provide sturdy cellular bins that are backfilled with earth to assure stability. These walls are used to stabilize slopes, increase roadway widths, hold back fills or simplify grade separations. They are specified for highway, railway and industrial applications.

Armco Retaining Walls are one of many Armco products designed for drainage and construction work. Write us for data, telling us about your problem. Armco Drainage & Metal Products, Inc., 4977 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

This photo shows the Armco Wall during installation.

Armco Bin-Type Retaining Walls

ARMCO®

For more facts circle 590 on Reply Card

"Ground Sensor" team on General Electric Metal-Clad Switchgear is designed to

MINIMIZE MOTOR FAULT DAMAGE

Ground fault currents as low as 15 amperes will activate General Electric Metal-clad switchgear equipped with optional "Ground Sensor" equipment.

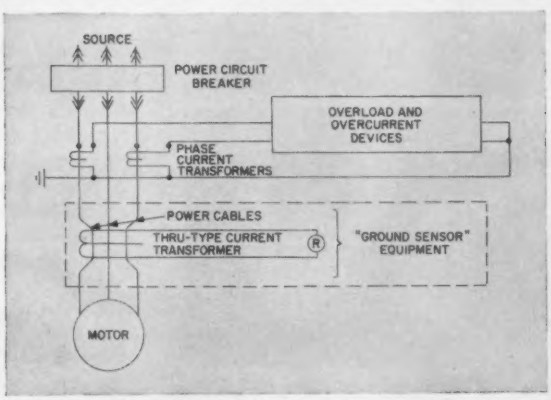
"Ground Sensor" teams a carefully matched current transformer and relay to offer this major advance in protective equipment for motors.

The unusual sensitivity of this equipment, combined with its instantaneous relaying acts to:

1. Practically "anticipate" trouble through early detection of ground faults and
2. Remove motors from the line *before* major fault damage can occur.

This more positive protection minimizes motor maintenance costs and limits expensive down time for motor repairs.

For full information on Metal-clad Switchgear with "Ground Sensor," see your G-E Sales Engineer or write Section 511-19, General Electric Company, Schenectady 5, N. Y.



A typical schematic diagram, showing location of "Ground Sensor" elements. Relay and current transformer team-up to detect ground faults and remove motors from service before major fault damage occurs.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 591 on Reply Card

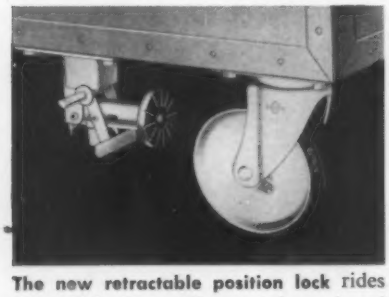
MATERIALS-HANDLING NEWS

★ NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS ★

Position locks secure castered equipment

Portable ladders (this one is used in a large aircraft plant), work stands, scales, scaffolds and other equipment often need to be held stationary. Bassick truck locks—easy to set or disengage with foot—provide the answer. In most cases, two locks should be used and located at opposite corners of the truck as near as possible to the caster wheel.

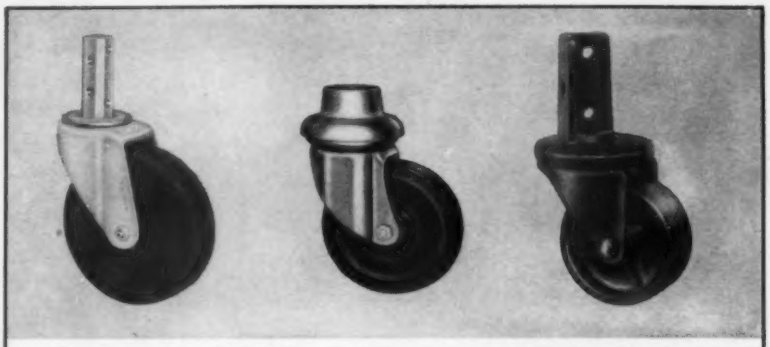
The regular position lock (above) is furnished with either flat base for regular floors or with grooved base for use with Bassick grooved wheel casters.



The new retractable position lock rides 3¼" off the floor. Allows trucks equipped with lock to clear ground obstacles.

Your distributor can help

Your local Bassick distributor has many standard casters, wheels and accessories in stock. He keeps needed units flowing from his stockroom into your plant.



Angle stem casters for direct application to angle iron legs. Stem is designed so that separate right and left hand types are not needed.

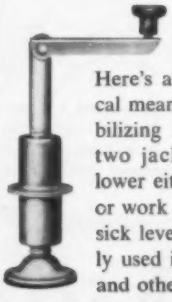
Pipe socket casters can be supplied with female threads for practically any equipment with pipe legs. All standard types of wheel available.

Angle plate caster has a special bracket plate (specify right or left hand plate) to be used with equipment having angle legs.

Caster accessories solve special in-plant problems

Wheels for special jobs

Here, for example, are acid-resistant "Canaphin" wheels on Bassick casters used in a large chemical plant. The portable still they're carrying is used in processing fine organic chemicals. Bassick casters can be supplied with a variety of other wheels—soft, hard, or having special qualities that fit them for specific jobs.



Levelizing jack

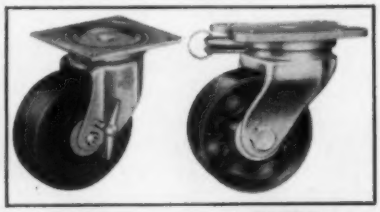
Here's an economical, practical means of levelizing or stabilizing equipment. By using two jacks you can raise or lower either side of a scaffold or work stand as desired. Bassick levelizing jacks are widely used in aircraft production and other plants.

Your local Bassick distributor can show you a variety of different caster attachment styles. Or, if your problem is a special one, he can call in a Bassick field engineer to make recommendations.

Wheel brake and swivel lock

This side wing brake (below left) is available on 5" and 6" Bassick "77" or "H99" series casters; can be specially fitted for other sizes. It's engaged or released by turning the wing nut.

The plunger swivel lock (below right) positively locks caster swivelling action. Standard on Milspec casters, it's also available on special order on many other Bassick casters. 7.40



see our catalog in Sweet's or write for copy

THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada: Belleville, Ont.

Bassick
A DIVISION OF STEWART SW WARNER

MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE

For more facts circle 592 on Reply Card

For more facts circle 593 on Reply Card →

END CONCRETE "DUSTING" WITH ONE SWIPE

Seal and finish concrete with Conq-r-Dust!

In one simple step you control dust TWO WAYS when you use Johnson's Conq-r-Dust on concrete floors! You *seal* the surface to prevent the breaking away of small concrete particles. You *finish* the surface to smooth out jagged pits and pockets that hold deposited dirt and dust. Sweeping and all floor care become far easier. Dust damage—to machines, stocks in storage, health—is prevented. Use on cured or uncured concrete—no neutralizing necessary. Conq-r-Dust is one of Johnson's complete line of superior floor care products. Order today from your local Johnson's Wax distributor.

FACTORY FLOOR CONSULTANT SERVICE

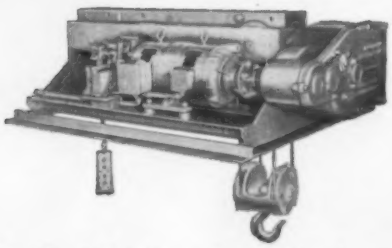
Use Conq-r-Dust or other heavy-duty Johnson Wax products and most floor problems are solved automatically. If you should run into a problem where help is needed, ask your distributor to call in a factory-trained Johnson J-Man.

A PRODUCT OF

JOHNSON'S WAX

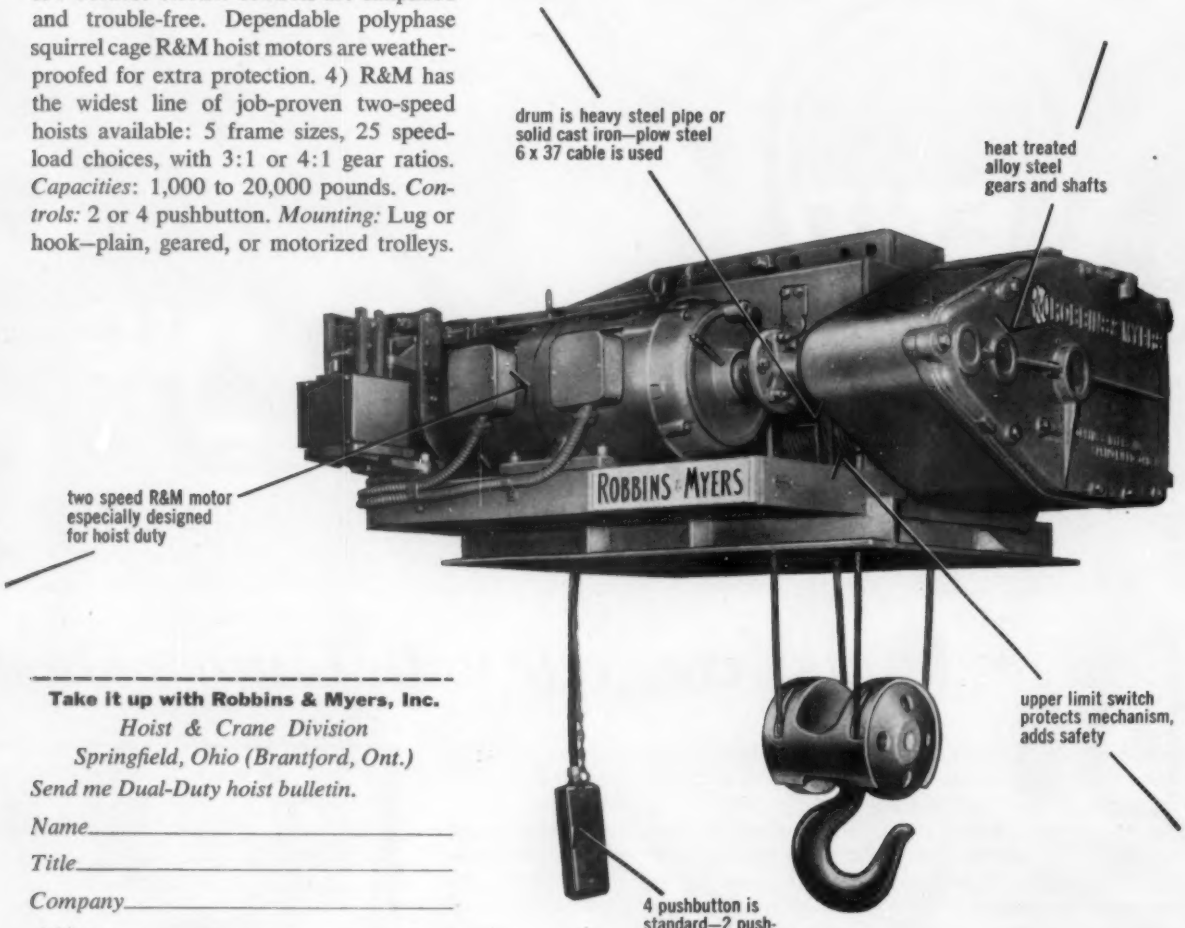
For your distributor's name, write:
S. C. Johnson & Son, Inc.
Maintenance Products Department, PE-67
Racine, Wisconsin

PRODUCTS AND SERVICES FROM JOHNSON'S WAX TO SOLVE ANY FLOOR PROBLEM



Dual-Duty two speed hoists give you *precise* load spotting, plus fast lifting when you want it. Four outstanding advantages make R&M Dual-Duty hoists your best buy when you can't afford performance compromises: 1) You always have two stabilized speeds to raise or lower any load within the capacity of the hoist. 2) Dual Duty hoists are thus easy to operate—they perform exactly the way the operator wants them to. 3) First cost and maintenance are low because electric controls are simplified and trouble-free. Dependable polyphase squirrel cage R&M hoist motors are weather-proofed for extra protection. 4) R&M has the widest line of job-proven two-speed hoists available: 5 frame sizes, 25 speed-load choices, with 3:1 or 4:1 gear ratios. *Capacities*: 1,000 to 20,000 pounds. *Controls:* 2 or 4 pushbutton. *Mounting:* Lug or hook—plain, geared, or motorized trolleys.

slow spotting, fast lifting hoist


drum is heavy steel pipe or solid cast iron—plow steel 6 x 37 cable is used
heat treated alloy steel gears and shafts
two speed R&M motor especially designed for hoist duty
ROBBINS & MYERS
upper limit switch protects mechanism, adds safety
4 pushbutton is standard—2 push-button is optional at no extra cost

Take it up with Robbins & Myers, Inc.
Hoist & Crane Division
Springfield, Ohio (Brantford, Ont.)
Send me Dual-Duty hoist bulletin.

*Name*_____

*Title*_____

*Company*_____

*Address*_____

ROBBINS & MYERS hoists • cranes • winches

For more facts circle 594 on Reply Card

ALUMINUM-SHEATHED CABLES

...light ...strong ...smaller diameter ...easy to install and terminate

A seamless aluminum sheath over Okonite cables provides a durable, conduit-type covering of high tensile strength. Yet this aluminum sheath is easily worked with standard conduit tools. It can be bent around obstructions . . . terminated at boxes, transformers, and the like . . . trained in trays . . . or supported by conventional brackets and cable clamps. Standard fittings are available. This low-cost alternate to rigid conduit is available with virtually any Okonite insulation such as rubber, plastic or varnished cambric.

Here are some important benefits of Okonite's aluminum-sheathed cables:

Reduced diameter and lighter weight.

Impervious barrier to liquids and vapors.

Excellent flame resistance.

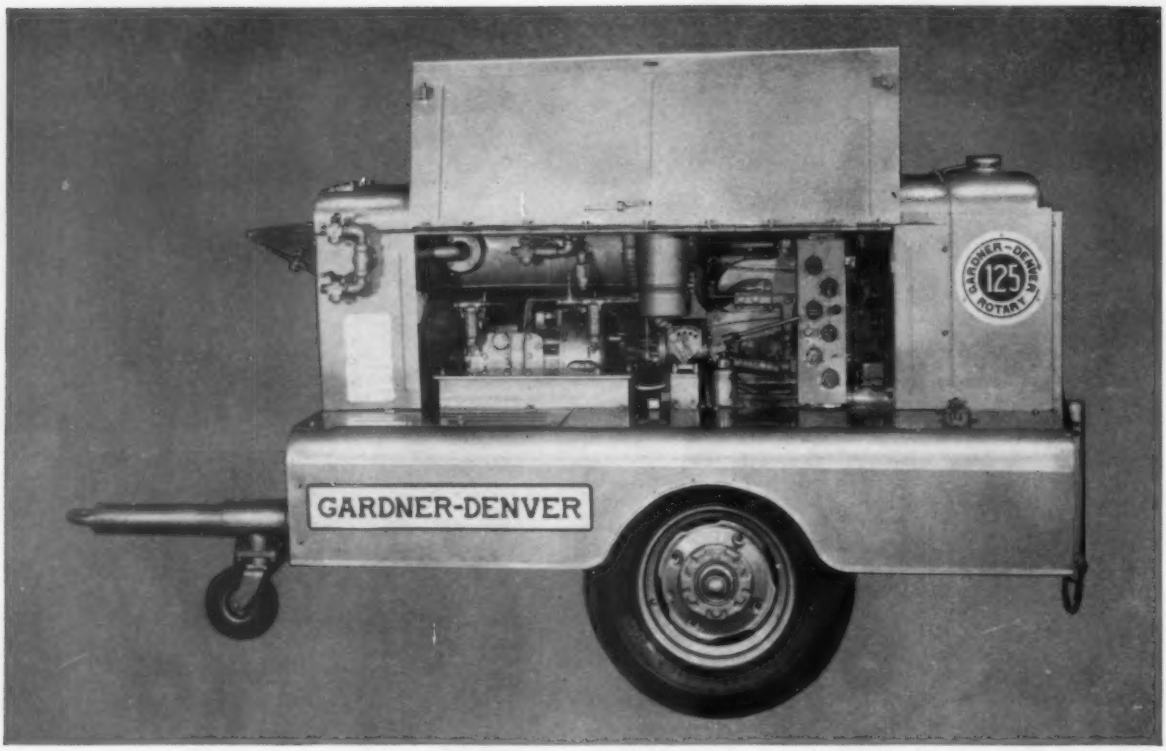
Costs less than regular conduit installations.

Great mechanical strength, yet easily worked.

For complete data on Okotherm-insulated (silicone rubber compound) aluminum-sheathed cable for use in high ambients up to 200C (392F), contact your Okonite representative or write for Bulletin PE-1088A, The Okonite Company, Passaic, N. J. 4742

***where there's electrical power . . . there's* OKONITE CABLE**

For more facts circle 595 on Reply Card



New Gardner-Denver Model RP125 rotary portable compressor, available with either gasoline or diesel engine.

This little rotary was designed big

Here's a portable that combines big Gardner-Denver rotary advantages into a small, compact workhorse: Clutch for cold-weather starting. Circulating water system that warms compressor oil before it turns over. Water cooling for steady running in any weather. Easy inspection. Easy maintenance. "THRIFTMETER"® control saves engine, compressor, fuel. If you need low-cost air, the Gardner-Denver Rotary 125 will deliver it.

Team up the RP125 with Gardner-Denver quality air tools.

Paving breakers

New T43 tamper

Utility drills

Also: sheeting drivers, clay spaders, trench diggers, impact too's, grinders, sanders and chippers, air hoists from 150 lb. to 2 tons. Write for descriptive literature today.

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GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

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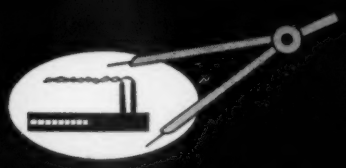
DU PONT ELASTOMERS

neoprene · Hypalon

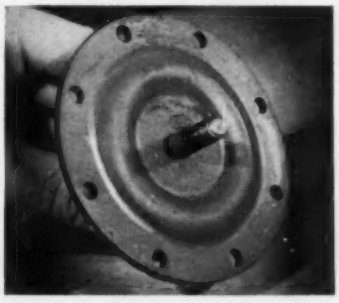


in industry

NEOPRENE fire hose is good as new after three years in refinery

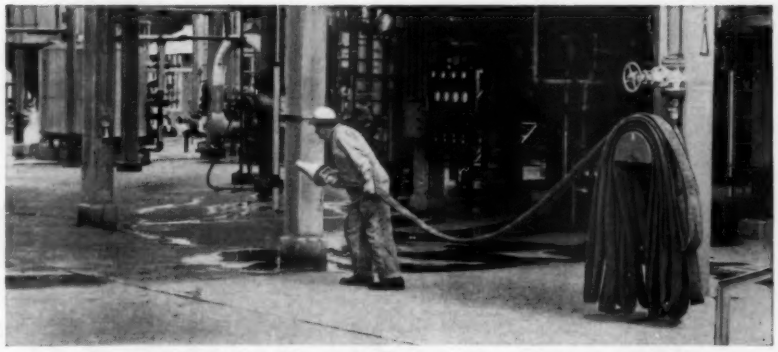
Exposed to 66° Be. sulfuric acid —HYPALON diaphragm gives 2 years' perfect service on acid pump

In November, 1954, a HYPALON diaphragm was installed in a proportioning pump in the plant of Fields Point Mfg. Corp. at Providence, R. I. Since that time it has been on continuous service handling 66° Be. sulfuric acid. Before the use of HYPALON, diaphragms were oxidized and embrittled by the strong acid and had to be replaced every few months.



The diaphragm flexes about 26 times a minute through a ¼-in. stroke and is fabric-reinforced for 125 psi. service. The sulfuric goes from the pump to a stoneware tower where it dries chlorine gas from electrolytic cells.

HYPALON is a new Du Pont synthetic rubber which is noteworthy for its resistance to oxidation — by chemicals, heat, ozone, sunlight and weather. It is being used in the chemical industry for tank linings, acid hose, colored protective coatings, gaskets, valve inserts and pump parts. For more information about HYPALON, just mail the coupon.



New neoprene hose with cover of *Dacron* far outlasts conventional cotton-reinforced rubber hose. Latter was deteriorated by oils and acids.

Dragged over rough floors, through oil and chemicals ...still meets safety specifications

"I have never picked up a hose that will equal it," is the endorsement of Karl Pepper, a 25-year fire-fighting veteran and Safety Director at D-X Sunray Oil Company's refinery at Duncan, Oklahoma. Heart of this hose is neoprene; its hide is *Dacron**: neoprene tube for flexibility and resistance to oil and chemicals; cover of *Dacron* for strength and abrasion resistance. In areas where excessive oil contact is encountered the cover is impregnated with neoprene.

This rugged new industrial fire hose weighs only 30 lbs. per 50-ft. length compared to 58 lbs. for the same length of conventional rubber fire hose. It will withstand 500 psi. pressure and 300°F. temperature. Unlike cotton-covered hose, it is unaffected by mildew, and is so flexible it can be tied in a knot without harming it. The hose can be stored all year, as at the D-X Sunray Refinery, in outdoor racks without deterioration.

D-X Sunray switched from cotton-reinforced rubber fire hose to overcome the deterioration experienced from acids and oil. Nearly 2500 ft. of neoprene hose with cover of *Dacron* are now in service at the refinery and no maintenance has been required since the first length was purchased in July, 1954.

Fire hose is only one application where versatile neoprene may help cut operating and maintenance costs. Its service record is outstanding where exposure to oils and chemicals, sunlight and weather, or cutting and abrasion would ruin ordinary rubber. Tank linings, gaskets and belting are but a few uses. Mail coupon for full information.

*Du Pont's trademark for its polyester fiber

DU PONT
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HYPALON *is a registered trademark of E. I. du Pont de Nemours & Co. (Inc.)*

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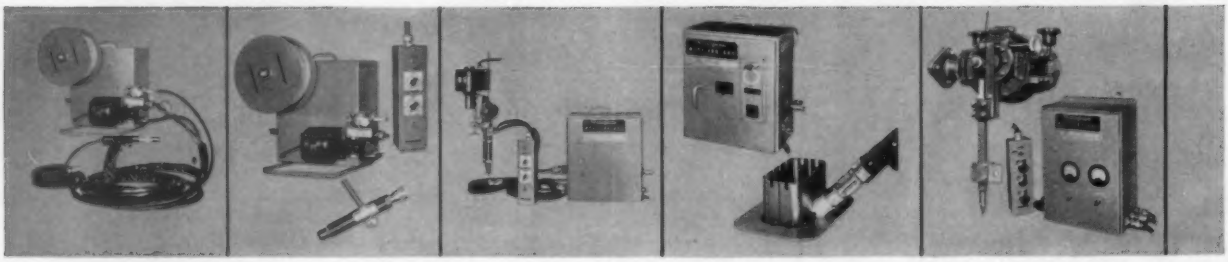
Up to 200% faster on mild steel!

New WEST-ING-ARC



Model SA-1, for semi-automatic operation. Dynamic braking permits re-striking the arc without inching or trimming wire.

Model SA-10, automatic with extreme flexibility. Includes, additional relay panel and operator's remote control station.

Model SA-20, for medium-duty automatic welding. Adjustable mounting brackets permit components to be applied directly to fixtures.

Model SA-30, for semi-automatic or arc spot welding. Simple attachments facilitate all tack and plug welding.

Model SA-40, for extra-heavy-duty, fully automatic operations. Readily connected to utilize CO_2, argon or submerged-arc welding.

CUTS TOTAL WELDING COSTS AS MUCH AS 30% (with M. I. G. welding of steel)

WEST-ING-ARC welding equipment automatically feeds electrode wire into the arc, at a constant, pre-selected rate. Also facilitates arc strike, wire-inching and wire-feeding speed, and control of power, shielding gas and cooling water in proper sequence.

All WEST-ING-ARC welds are clean and sound, with exceptional physical properties and appearance. Fillet, lap, butt, plug and tack welds all are made with well-controlled penetration!

auto matic welding equipment

No abrasive flux is used. So all undue maintenance of fixtures and of materials-handling equipment virtually is eliminated! *Savings of 50¢ per deposited pound!—at speeds up to 90-inches per minute!*—with CO_2 gas, where applications are suitable.

There are WEST-ING-ARC units to benefit your facilities! to supply from push-button start and steady repeat operation— to all the versatility and portability of a mobile, completely self-contained, "packaged" unit!

Get *complete* information on dramatic economies you can effect, from your local Westinghouse representative—or, write to: Westinghouse Electric Corporation, Welding Division, Box 868, Pittsburgh 30, Pennsylvania. J-21986

See automatic welding on wheels!—the new, Westinghouse PORT-ARC—**Model SA-30P.** This same speed and economy, with mobility and ease, is applicable for WEST-ING-ARC models SA-1, SA-10, SA-20 and SA-30.

Call your Westinghouse representative NOW!—Then *POWER-UP* with advanced Westinghouse welding equipment!

YOU CAN BE SURE...IF IT'S

Westinghouse

For more facts circle 598 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

Use the Reader Service Cards provided on pages 269-270 to ask for more information on these products. Circle item numbers of products in which you are interested.

1—AIR COMPRESSOR features safety, compactness

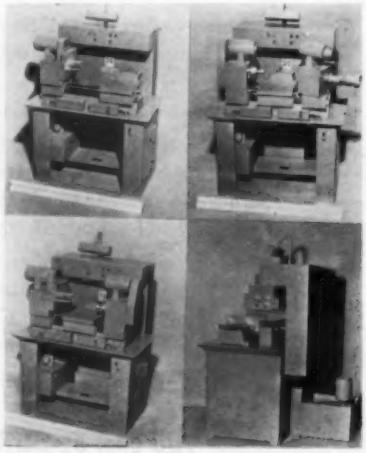
The Channel-Flo is a two-stage, 200-psig rated motor compressor presently available in 1½-and 2-hp sizes. The complete packaged unit includes motor compressor, cushioned rubber mounting on an ASME vertical tank, interconnecting piping and fittings and automatic start-and-stop control. Manufacturer claims important safety and space-saving features in this unit. The compressor is flange-mounted directly on the driving motor, it is noted, and thus requires less floor space than tank-mounted, belt-driven units of comparable size. It can also be mounted on a shelf, side wall or overhead bracket with air receiver in out-of-the-way area.

The unit derives its name from company's Channel Valves used in both low and high pressure cylinders. Introduction of this valve in the small compressor sizes is said to mean less valve maintenance and longer compressor life. The Channel-Flo features balanced-opposed piston construction, and a new piston design said to afford low oil consumption. Form 1547 gives details. Ingersoll-Rand Co.

2—FINISHER has custom features, availability

This small, high-precision unitized finishing machine is designed to provide versatility and economy without sacrifice in accuracy. Designed around a number of standard, interchangeable units, or "building blocks," the unitized boring machine can be set up as a dozen different basic machines with hundreds of combinations in tooling and fixture equipment to perform a wide variety of boring, facing, turning, chamfering, grooving and similar operations. Greatest applications are anticipated in machining of small parts where versatility of use and moderate cost are considerations. Four basic machine set-ups are shown.

A major feature announced is a radically new multi-spindle unit with miniature boringheads that permits savings in time, effort and expense on a broad range of small work requiring precision finishing of closely-spaced multiple holes. This unit is expected to increase production rates and lower unit costs in finishing of parts which formerly had to be machined one hole at a time on larger equipment



requiring highly skilled operators. With this cluster head arrangement any number of holes on close centers can be finished simultaneously in a single set-up, it is stated, and the operation can be duplicated continuously on a high-speed basis with accuracy. The Heald Machine Co.

3—SLIDING DOOR for use with insulating glass

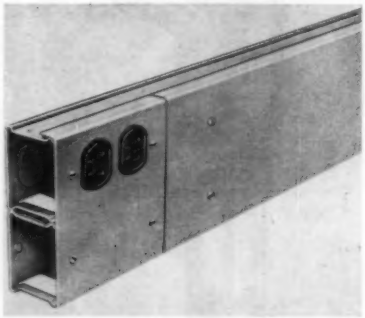
The Pittco Twindow is a sliding door for 1-in. double-glazed insulating glass to provide maximum comfort for the architecturally popular sliding glass walls. It is quiet and smooth in operation, says manufacturer—glass panels roll on Nylon-tired ball-bearing sheaves guided by an aluminum track that is capped with stainless steel to eliminate drag and pick-up. Two point contact pile weathering all around serves as a barrier against weather, dust, insects and moisture. Design of the all tubular extruded aluminum door-frame is described as simple, but strong. Pittsburgh Plate Glass Co.

4—SPACE HEATERS are direct-fired steel units

Large stainless steel, direct-fired space heaters in this series have individual unit capacities from 400,000 to 2,000,000 Btu. They may be equipped with gas, oil or dual-fuel burners, and operate with fuel oils through No. 5, or natural, mixed, manufactured or LP gas. Combination gas-oil units can be supplied with interchangeable burners or with a single burner that can be adapted for the second fuel by flicking a switch. The heaters can be installed for top, bottom or horizontal discharge and are readily adapted for use in duct systems, company notes. When installed without ducts, multiple individually-adjustable horizontal louvers enable control of the air distribution pattern. Reznor Mfg. Co.

5—RACEWAY carries high and low conductors

Twinduct is a metal surface raceway designed to carry both high and low potential conductors in a single run. Engineered into Twinduct are features of company's Surfaceduct, a 2-by-2 surface raceway designed to service loads falling within the range of No. 6 AWG conductors. Main difference between the two products is that Twinduct offers two



separate 2-by-2 raceways with a single screw-on cover. Twinduct incorporates the "lay-in" principle of wiring. It is noted that because of its design, a maximum amount of unobstructed space is retained inside the raceway for installation of conductors. This is made possible by a bridge which retains wires during installation, holds capping and serves as method of installing devices in raceways.

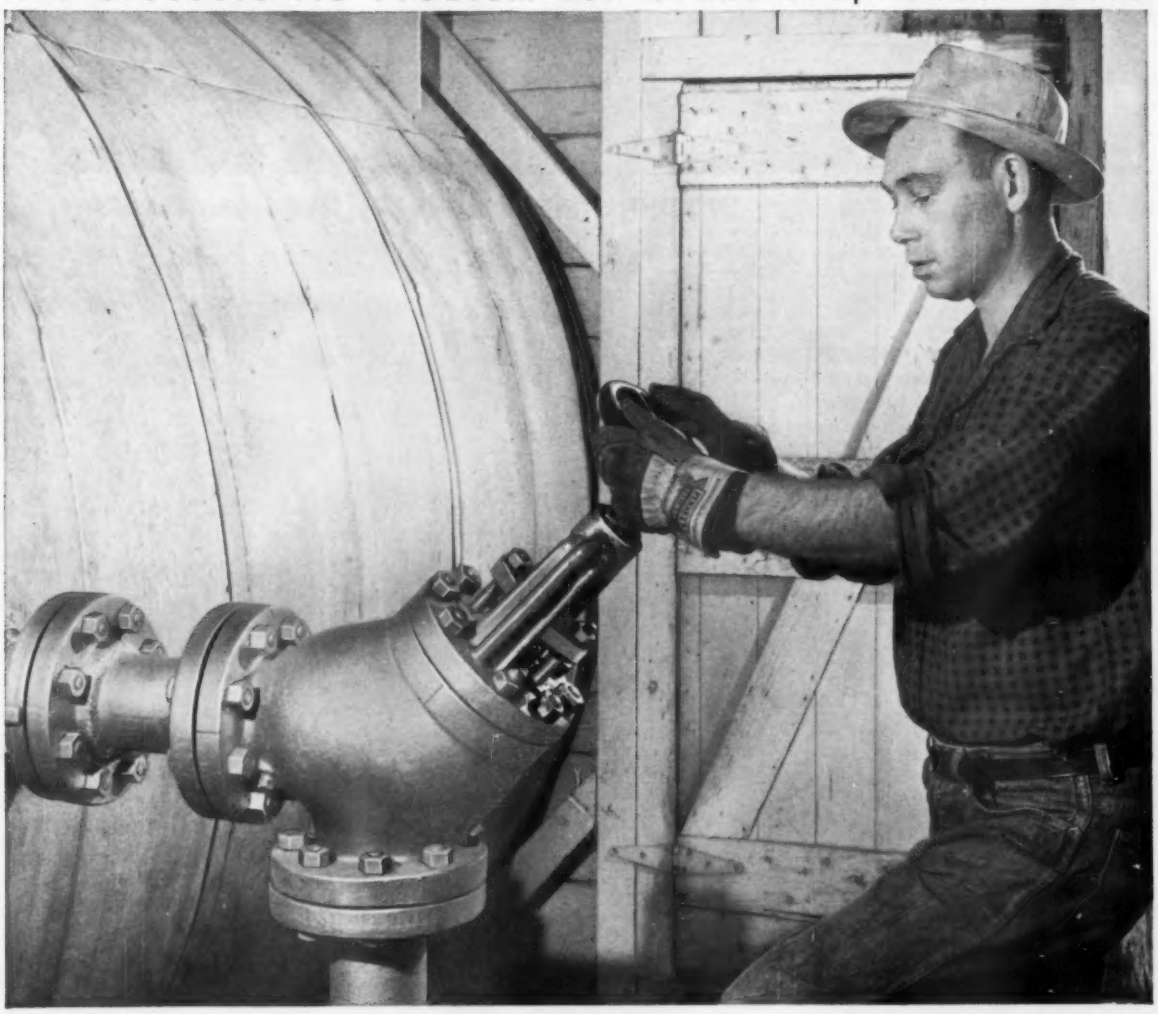
Covers are available to adapt to approved outlet devices up to 20-amp capacity. Without devices, the sytem becomes an economical and efficient duct, manufacturer states. Twinduct is finished in a satiny gray, comes in 10-ft lengths with ½- and ¾-in. knockouts and mounting holes on 15-in. centers in the base. Bridges are furnished with each 10-ft section. National Electric Products Corp.

6—HEAT EXCHANGERS available as required

This standard line of single- and double-pass carbon shell heat exchangers is introduced to enable solution of many heat exchanger problems without special or complicated designs but meeting ASME and TEMA code requirements. The "off-the-shelf" units are available from prestocked stainless steel heat exchangers in a variety of sizes from 56 to 316 sq ft within two weeks. Other sizes up to 20-in. shell diameter are assembled from a stock of "flexible standards" including tubing, bonnets, shells, baffles, nozzles on four-to-six weeks delivery.

Plant engineers can specify design features previously considered as custom at standard costs, it is pointed out. Many combinations of diameter and length are available for any given heat transfer

Hot Creosote No Problem for Crane Stop-Check Valve



Defies splinters, dirt and grit

Handling hot creosote seems like an unusual application for stop-check valves. And it is!

But this installation points up dramatic proof of Crane quality—and what it means to cost-free operation.

For ten years the Long-Bell Division of the International Paper Company, at Longview, Wash., has had this Crane angle stop-check valve on a hot creosote line from a retort. The valve is operated every 24 hours. Occasionally solids come through—wood splinters, slivers, dirt and grit—and yet this Crane No. 30E 250-pound valve has a trouble-free record clear of any maintenance costs.

Why take chances with your valves—the heart of your flow control system. Be sure: specify Crane valves and fittings from the big, complete, strictly quality Crane line—industry's first choice for over a century.

YOU'LL WANT a copy of "Valve Performance Facts"—32 case histories covering valve installations throughout industry. Contact your local Crane Representative or write Crane Co. at address below.

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NEW PRODUCTS

(Begins on page 188)

service, and the number of passes can be varied. Flange nozzles or couplings can be installed in any position required, and shell side baffles at any desired spacing. Standard shell diameters range from 4½ to 20 in. These units are designed for 75 psi tube pressure and 150 psi shell side pressure up to 300 F. Only slight modifications are required for the higher pressures. The Pfaudler Co.

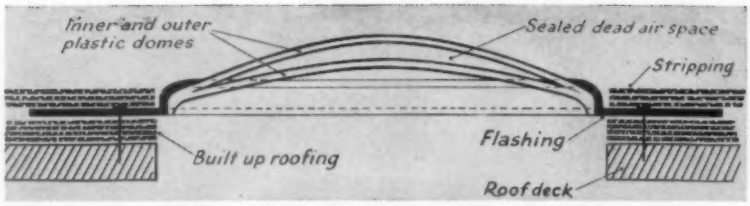
7—PANELBOARD is compact plug-in equipment

This plug-in combination lighting and power distribution panelboard is designed to accommodate combinations of single-, two-, and three-pole circuit breakers up to 54 poles. With a maximum rating of 240 v, a-c, and mains rated to 600 amp, the equipment is offered as either a panel-base assembly (Type TQLP) or as an assembled panelboard (Type TQLA). Both of these are specifically designed for company's new 15-50 amp single-pole and common-trip type two- and three-pole Type TQL circuit breakers. By using the compact TQL breakers, which are about half the size of conventional E frame breakers, the new panelboard is smaller than those using E-frame breakers. The plug-in feature, which allows the breakers to be arranged in various combinations, means the branch circuits can be altered to meet changing applications. General Electric Co.

8—COLOR COAT covers black bituminous coatings

Color Coat 261 is claimed to stick to and cover black bituminous coatings, old or new, as well as concrete, brick, cinder block, porous roofing tile, asbestos shingles, stucco, and properly primed wood

and metal. Drying time is given as approximately 30 min. A modified acrylic resin dispersion combined with chemically inert pigments, Color Coat 261 leaves a tough pigmented plastic film that flexes with expansion and contraction of base material, says manufacturer, and it is especially suitable for color keying service lines. It is also reported to show resistance to weather, sunlight, gases, corrosive fumes, cleaning compounds and many solvents. Available in eight standard colors, Color Coat 261 is declared safe to store and apply. It goes on with conventional spray, brush or roller. Insul-Mastic Corp. of America.



9—SKYLIGHT curbs heating and air conditioning losses

Utilizing a design based on the "thermos bottle" principle, this glass fiber-reinforced plastic skylight is reported to greatly reduce heating and air conditioning losses, and to provide a high level of diffused natural light within the building. Called the Consolite Double Dome Skylight, it is actually a twin-domed insulating plastic bubble reinforced with fiber glass. The dead air space between its inner and outer domes gives it a low rate of heat transmission.

Produced by Consolidated General Products, Inc., this unit is intended primarily for use on modern industrial and other buildings. Manufacturer says that this double-thickness Skylight cannot be shattered by ordinary hailstones, rocks, shock or vibration. Although light in weight, it is claimed to support a dead weight of 200 lb per square foot. Due to its double-dome construction, no interior provisions for condensation control are needed, it is pointed out. The skylight comes in square, round and rectangular shapes, and in three basic models: self-flashing, curb-mounting and bond type, 18 to 74 in. across. Resolite Corp.

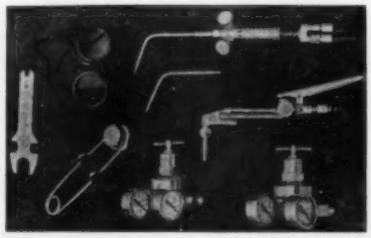
10—RESIN ADHESIVE is dextrine compatible glue

E2131 is announced as a high strength, clean machining polyvinyl acetate resin emulsion glue, which is dextrine-compatible and can, therefore, be interchanged with any borated alkaline dextrine adhesive without packaging machine shutdowns to clean the glue box. It means, says manufacturer, that you can use less expensive adhesives in the packaging machines for ordinarily simple container sealer runs—yet switch to the new resin formulation by simply pouring it into the machine when those cases come down the line which require faster tack, more water resistance, higher bond strength. According to company, E2131 is white, 2100 cps in viscosity, non-foaming, non-stringing; it won't build up and has the speed and strength characteristics of a PVC base product. Paisley Products Inc.

11—THERMOSTAT for corrosion resistant service

Model 18000-26 Thermoswitch Unit is fabricated entirely from 316 stainless steel. For additional corrosion resistance, exterior joints are heliarc welded. Because of its special construction, this unit is claimed especially suited for service in 5 per cent H_2SO_4 at temperatures to 120 F (or in higher concentrations at lower temperatures), acetic acid vapors, halide solutions, alkaline solutions, and other materials to which 316-type stainless is resistant.

The unit is supplied with coupling-head mounting having a ½-14 pipe thread for direct threading into a tank or pipe wall. Contacts open above the control setting. Control temperatures are adjustable over a range of -100 to 400 F, and short-time overshoot by as much as 100 deg will not affect reliability, says company. Current rating is 10 amp, 115 v a-c. The cartridge is ⅝ in. diam, has an immersed length of 3 in. The thermostat is designed to control within 2 F. Fenwal, Inc.



12—WELDING, CUTTING KIT for light-duty applications

For performance in the light-to-medium range, this welding and cutting outfit is claimed especially suited for plants where intermittent service makes low cost a factor in equipment selection. The oufit is designed to handle welding, brazing, heating, and cutting operations, for welding metals up to 3/16 in. thick, or up to 5/16 in. if larger tips are used, and cutting steel plate up to 1-in. thick. Equipment necessary to do a welding or cutting job includes two Style 8000 single-stage regulators, twin 3/16 in. gas hoses with connections, Style 400 lightweight welding torch with a mixer and two tips, and Style 1490 cutting attachment with one tip. A wrench, sparklighter, and goggles complete the outfit. When assembled for cutting the combined weight of the torch and cutting attachment is only 19 oz; overall length is 12½ in. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

13—BONDING ALLOY fastens things to concrete

Steelpatch is announced as an easy-to-use alloy of micronized steel and epoxy resin for fastening conduit, piping, shelving, bracks, wood and other materials to concrete without special tools or drilling.

According to company, the bond formed is usually stronger than the materials bonded, and a single bracket properly applied will support several hundred pounds. The joint is claimed

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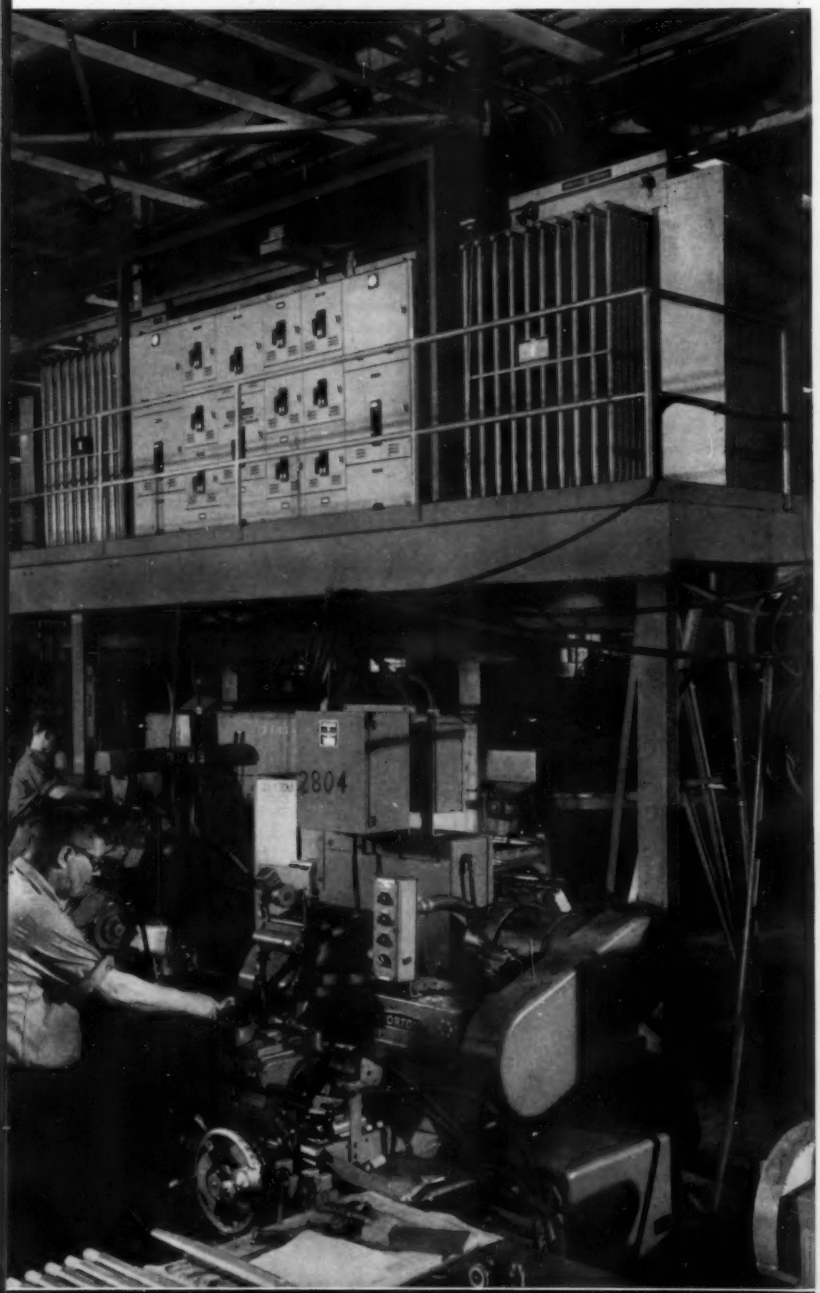
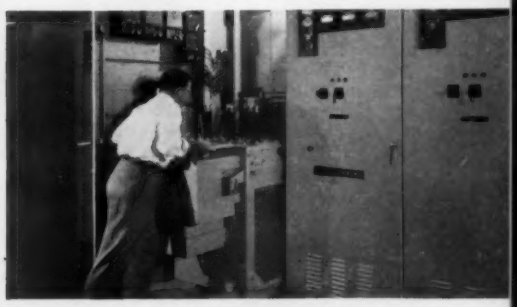
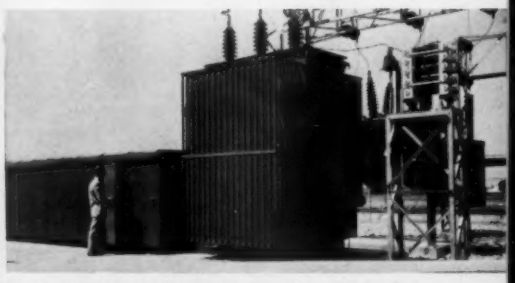
PROVIDE CONTINUOUS PRODUCTIVE POWER IN YOUR PLANT WITH A GENERAL ELECTRIC POWER DISTRIBUTION SYSTEM



The finest electrified equipment in your plant can become useless if your power distribution system is not fully reliable. General Electric metal-enclosed equipment ***in simple circuit arrangements,*** offers you that vital system reliability. For expert assistance in planning and equipping your power distribution system, consult your nearest General Electric Apparatus Sales Office. 680-7



RELIABLE metal-clad switchgear with draw-out magne-blast circuit breakers offers maximum continuity for your plant power system.



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COMPANY_____

ADDRESS_____

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GENERAL ELECTRIC

NEW PRODUCTS

(Begins on page 188)

unaffected by heat, moisture and many chemicals. Careful measuring of components isn't required, it is noted, and since consistency is putty-like, rough surfaces can be joined. Manufacturer says Steelpatch can also be used to "glue" steel and other broken machinery parts together, fill castings, repair pipe leaks etc. For small repairs or attachments it is used alone; to cover large open areas it can be reinforced with fiber glass, or other material, to hold it in place while it is curing. It comes in 5-oz tubes and larger containers. The Lockrey Co.

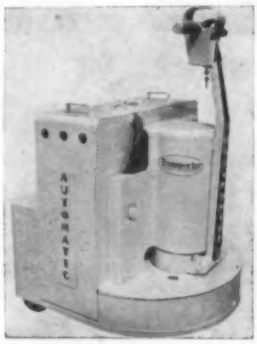
14—GLAZING SHEETS are plastic reinforced

Flat, translucent sheets of fiber glass reinforced with plastic, called Glazor, range in sizes from standard sash to 48-by-96 in. The sheets are press molded from 3-oz mat for greater rigidity. Glazor is reported more than twice as strong as many corrugated sheets. Available in white, natural, light blue, and two shades of green, it is suggested for use in skylights, sidewalls, canopies and windows, as well as partitions, door hoods, shower stalls and loading docks.

According to manufacturer, Glazor will support 100 lb per square foot on a 4-ft span; it cannot be damaged by welding sparks, or similar ignited particles, and can be made flame-resistant by the addition of a self-extinguishing resin. It is installed with regular wood-working tools. When used as roofing or siding, Glazor is said to admit more than adequate diffused light, reducing the need for artificial light. Pound for pound, Glazor is tougher than steel, company claims, yet it is non-rusting, and unaffected by acids, most alkalis, fungi or humidity. It is reported to stand vibration and not crack or warp. Strick Plastics Corp.

16—INDUSTRIAL TRUCK can turn in 4-ft aisle

In accordance with its modernization program of producing shorter models in the operator-led industrial truck line, this company has introduced Models WT-2A and 4A which measure only 35½ in. in



length—a reduction of 3½ in. over the retired model of the same capacity. The draw bar pull on the WT-2A is rated at 200 lb with an ultimate of 700 lb; the WT-4A has a normal draw bar pull of 400 lb with an ultimate of 700 lb. This draw bar pull doubles the old normal rating. Compact design enables truck to make a U-turn in a 4-ft aisle, company notes. Automatic Transportation Co.

17—MICROSCOPE for direct reading measurements

No larger than a fountain pen, this handy pocket instrument is offered for making direct measurements, checking small parts and dimensions under powerful magnification, and speeding up quality control. Instrument contains a precision glass etched reticle calibrated for measurements up to 1/10 in. by 0.001 in. divisions. According to company, estimates to 0.0005 in. can easily be made. Chrome reflector at base of instrument reflects light on object examined or measured. It is priced at about $8. Edmund Scientific Co.

15—ALUMINUM TREAD offers safety, low maintenance

This cast aluminum stair tread is announced as combining safer footing with long-term maintenance savings. It is for use in industries where stairs are subject to extreme weathering or corrosive atmospheres. It utilizes an abrasive nosing

to provide a slip-proof front surface. No protective coating is required for this tread, it is pointed out, and dirt won't collect in the rounded corners. Manufacturer says that because the grating is cast in one piece, concentrated loads are distributed more evenly over all bearing bars. Although designed to carry the weight of a heavy man, the stair is reported to withstand loads of 3000 lb.

Three finishes can be had. For standard structural purposes, the "as fabricated" surface is suggested. For sanitary stairways in food processing plants, there is a "polished" finish. In this, the tread surface is belt sanded, nosing is hand polished, and a clear lacquer applied to prevent tarnishing. A "marine" surface is available for treads subjected to sea water spray or immersion. Sizes now available range from 24 to 42 in. long. Standard width of the tread is 10 in. Aluminum Co. of America.

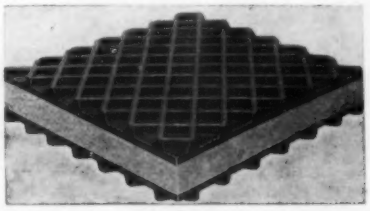
More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 269-270.

18—POLYETHYLENE TANKS for chemical solutions

For use with chemical solutions which include such additives as wetting agents, surface activators, and detergents, these tanks are of Agilene-8, described as a highly selected grade of polyethylene. Available at this time in lengths up to 4 ft, the tanks are claimed to be of particular value for plating, pickling and similar processing operations in which the by-products create a stress cracking environment. American Agile Corp.

19—MOUNTING PAD has waffle-grip embossed surfaces

Waffle-Grip Elasto-Rib is introduced as a new version of the Elasto-Rib line of machinery mounting and vibration control pads. This new pad-type mounting is claimed to offer an efficient, low-cost, non-slip cushion for mounting machinery without bolting, plus excellent vibration



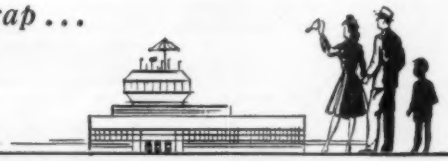
and noise control characteristics. It consists of a layer of resilient cork bonded between two layers of oil-resistant Neoprene which has been embossed in the waffle-type pattern. It is made in two types: standard, for loads to 60 psi, and high capacity for loads to 120 psi. According to company, the cross-rib construction increases pad deflection and offers extra resistance to machine movement, and provides an unbroken perimeter to keep dirt and cuttings from accumulating beneath pad. The Korfund Co., Inc.

20—SPEED REDUCER is shaft mounted unit

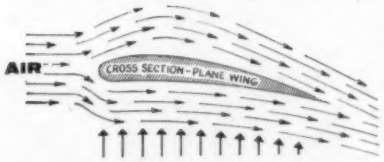
For many applications where complex multiple reduction belt or chain drives have been required, this shaft-mounted speed reducer is reported to offer flexibility of mounting arrangement, increased safety and lower maintenance expense. Ratio changes can be made in minutes simply by changing pulleys, it is pointed out, and a variety of pulley sizes makes the unit adaptable to a broad range of speeds. This speed reducer comes in most ratings from ¼ ro 40 hp at output speeds from 10 to 420 rpm. Company says it is easily mounted on the driven machine, while a standard drive motor can be

HOW THIS MODERN STEAM TRAP UTILIZES PRINCIPLE OF AIRPLANE LIFT!

New application of an old principle produces totally different type of steam trap . . . of great simplicity and effectiveness



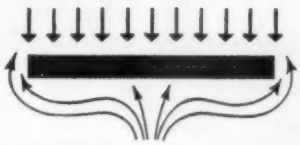
THIS GIVES AN AIRPLANE LIFT



Greater speed of air over curved upper wing surface creates lower pressure over this area (Bernoulli's Law) . . . resulting in **lifting** force.

THIS SAME PRINCIPLE USED TO CLOSE SARCO TD STEAM TRAP VALVE

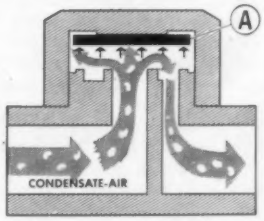
Valve is a simple hardened stainless steel disc.



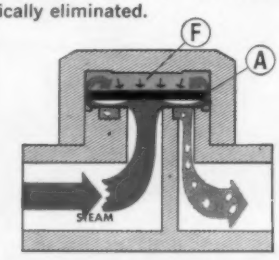
High velocity steam jet across bottom of valve disc creates low pressure area — resulting in **downward** force.

ONLY SARCO TD USES THIS UNIQUE OPERATING PRINCIPLE

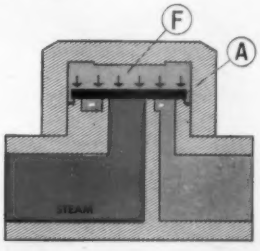
Result: Extreme simplicity—no valve mechanism—maintenance practically eliminated.



1. Inlet pressure raises disc "A" from seat . . . immediate discharge of air and condensate at steam temperature.



2. Steam follows condensate and the high velocity jet across bottom of disc "A" creates low pressure area (Bernoulli effect) . . . jet is deflected into chamber "F" where it builds up pressure by re-compression and this pressure acts on top of disc "A" . . .



3. Pressure in chamber "F", acting on full top area of disc "A", exceeds force of incoming steam and low pressure area under disc . . . and immediately forces it down, closing inlet. As condensation decreases pressure in chamber "F", disc rises and steps 1 or 2 repeat.

Small size . . . large capacity

Only 3 parts . . . all stainless steel. Sizes ⅜ to 1"—each body is as small as a tee fitting! Capacity is determined not by a bulky body but by the effective orifice, valve action, pressure drop and condensate temperature.

A few of many advantages

* *Practically no maintenance*—no valve mechanism, no narrow channels. Trouble-free, simple design.

* *Cuts trap inventory*—one large capacity seat for all pressures . . . for heavy, light, or no condensate load.

* *Self-adjusting for pressures 10 to 600 psi*—not a single change or adjustment required.

* *Operates perfectly when pressure fluctuates*—throughout full pressure range.

SEE FOR YOURSELF

We will gladly send you a Sarco TD Steam Trap and strainer for 60-day trial. No cost or obligation. Advise size —⅜, ½, ¾ or 1"—and application. Sarco Company, Inc., Empire State Bldg., New York City.

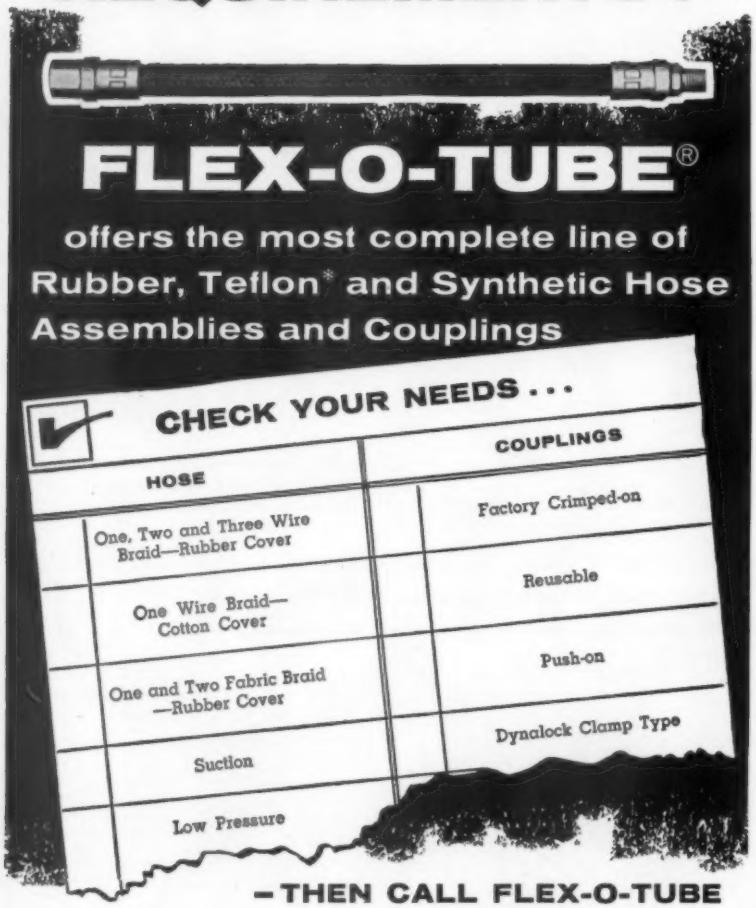
2204-C

SARCO Thermo-Dynamic STEAM TRAP

THE MODERN TRAP THAT IS MAKING STEAM TRAPPING HISTORY!

For more facts circle 601 on Reply Card

What are your HYDRAULIC HOSE REQUIREMENTS?



—THEN CALL FLEX-O-TUBE

At Flex-O-Tube you'll find the finest and most complete selection of hydraulic system components . . . all manufactured of top quality materials. The inner tube of Flex-O-Tube hose is composed of a seamless synthetic compound resistant to petroleum products, common hydraulic fluids, water and air. A wide variety of reinforcement and outer covering combinations are available.

Flex-O-Tube offers four kinds of fittings and couplings. (See chart above.) These are available in all standard connecting types.

Remember, for all your hydraulic hose and coupling requirements —write or phone Flex-O-Tube First!

When your requirements call for metal, specify Flexon Flexible Metal Hose, available in a complete range of sizes and types.

*Du Pont Trademark

H-6

FLEXON® QUALITY
proved in service and backed by over 55 years manufacturing experience

Flexonics Corporation
FLEX-O-TUBE DIVISION
1340 S. THIRD AVENUE, MAYWOOD, ILLINOIS
FORMERLY CHICAGO METAL HOSE CORPORATION
Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

For more facts circle 602 on Reply Card

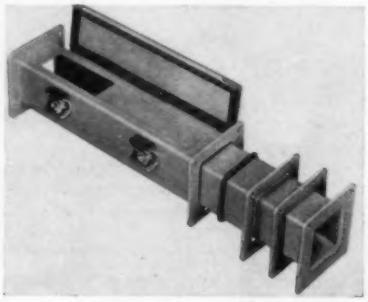
NEW PRODUCTS

(Begins on page 188)

located on the ceiling, floor, or wall, in virtually any convenient position. Compact and light in weight, the speed reducer has a 360-deg mounting range around the driven shaft, and is adaptable to a variety of shaft diameters. It comes in single and double reduction ratings, in 5-, 15-to-1 ratios. General Electric Co.

21—WIREWAY FITTING permits adjustment to length

Oiltight telescoping wireway fittings have been added to company's line of 2½ by 2½ in., 4 by 4 in., and 6 by 6 in. gasketed wireway for use on machinery or buildings where oil and dust are problems. When incorporated into a wireway

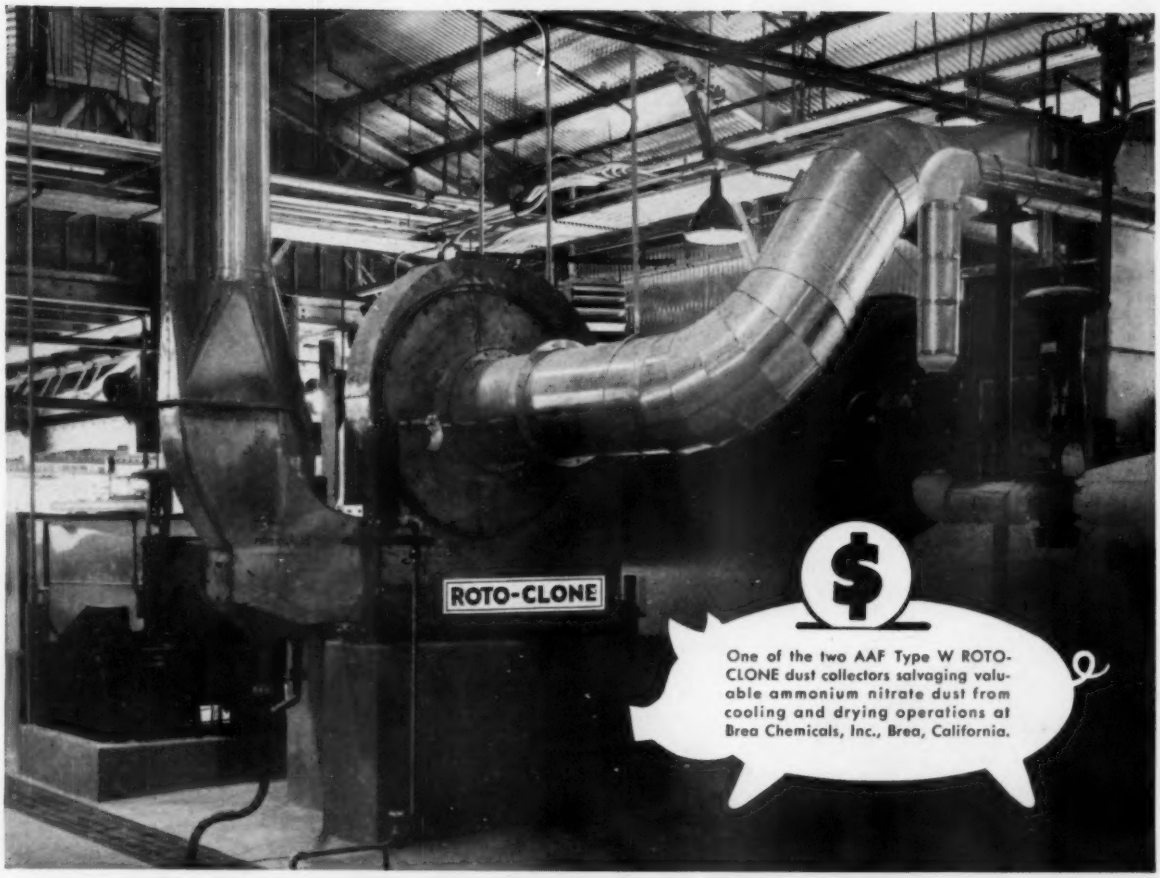


run, the telescoping section permits adjustment to desired length. After adjusting unit to proper length, the "O" ring gasket and the 2 sliding retainer plates are bolted to end flange of straight section to form an oil tight junction. The telescoping section for each of the three wireway sizes is 15½ in. long, and permits adjusting the length of an assembly between 1½ and 13½ in. It is made of 14-gage steel, except for the welded end flange and the two sliding sleeves, which are 11-gage steel. The finish is a baked gray hammertone enamel over a phosphatized surface. Hoffman Engineering Corp.

22—CONTROL VALVES for high speed applications

Hi-Speed Inlines are announced as high flow capacity, instant-action, poppet-type control valves. They are designed for use on large brakes, clutches and other devices, especially on high speed applications. They provide almost instantaneous response due to short poppet travel, says manufacturer, and this fast response provides shorter machine cycle time and results in increased work output. Other advantages cited are more accurate cuts on high speed cut-offs, less brake and clutch slip, faster machine set-up and improved operating safety because of minimum machine drift and over-travel.

Simple in construction, these valves have only three moving parts. The air-cushioned poppet is operated by a solenoid pilot. Valve bodies are cast Navy M bronze, moving parts are stainless steel. The valves are offered with integral


ROTO-CLONE
$
One of the two AAF Type W ROTO-CLONE dust collectors salvaging valuable ammonium nitrate dust from cooling and drying operations at Brea Chemicals, Inc., Brea, California.

AAF Dust Control Saves Brea Chemical $135,000 a Year!

Brea Chemicals, Inc., demanded *two* benefits from dust control equipment exhausting cooling and drying operations. One was dust-free discharge stacks; the other was *salvage* of valuable ammonium nitrate dust. They selected wet-collecting Type W ROTO-CLONES for this double-barreled job.

Instead of water, they use liquid ammonium nitrate in the Type W's scrubbing sprays. This allows all collected dust to be returned to the process as a usable solution. Five tons (which otherwise might have been a neighborhood nuisance) are salvaged every 24 hours — *an annual saving of $135,000!*

That's an example of the job being done by the Type W ROTO-CLONE throughout industry. The efficiency of this versatile dust collector results from its unique design, which combines the scrubbing action of liquid sprays and the principle of dynamic precipitation. For complete information, call your local AAF representative or write direct for Bulletin 274.

AAF Filters and Precipitators

Illinois Heating Specialties

American Air Filter
COMPANY, INC.
228 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

— BETTER AIR IS OUR BUSINESS —

AAF Dust Control Equipment

Herman Nelson Industrial Heaters

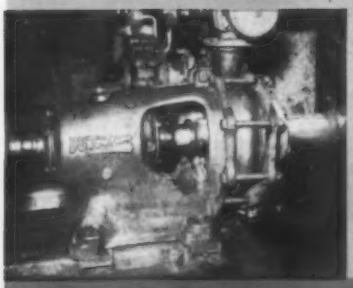
For more facts circle 603 on Reply Card

$793.50 Saved on Three Acid Pumps!

$793.50* has been saved, to date, on these three tough pumping jobs by reduced stuffing box maintenance. These pumps have given continuous, trouble-free service after

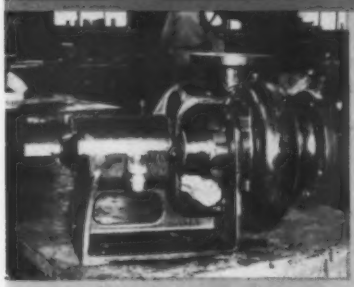
CHEMPRO Mechanical Seals†

were installed. In pump after pump, the Chempro seal has paid for itself in the first few months of service.



1 Durichlor Model X3RG-100 Durco-pump, handling 30% HCl in a dye-stuff plant. This large 2¼" Chempro Style WLC seal has operated for more than eight months without leakage.

2 LaBour No. 20 Type DLP pump unloading tank cars of oleum and 96% H_2SO_4 in a chemical plant. Before installing a Chempro Style WLZ seal, this pump was repacked weekly. The Chempro seal has given more than 11 months of trouble-free service.



3 Worthington 4CNG-84 pump operating on 94% H_2SO_4 in an oil refinery. A No. 175 Chempro Style WLZ seal solved the packing problem after it was installed more than seven months ago and is giving 100% leak-free service.

*Based on users' figures. †Patented

Write for new Chempro Seal Bulletin CP551

CHEMICAL & POWER PRODUCTS, INC.

The Original Fabricators of Teflon Packings and Gaskets

7 Broadway, New York 4, N. Y.

For more facts circle 604 on Reply Card

NEW PRODUCTS

(Begins on page 188)

pilots or for remote pilot operation in both two- and three-way types, normally open or normally closed. Working pressures range from 10 to 200 psi, in 1, 1¼- and 1½-in. NPT sizes. Valvair Corp.

23—PACKAGE DRIVE is adaptable to many uses

This package motor-clutch-brake drive is designed to provide fast or slow starts with acceleration, deceleration and/or stops in automatic cycles up to 30 per minute. Compactly designed around an air-gap motor closely coupled to magnetic clutch and brake components, the unit comes in 1½- through 15-hp sizes all with constant torque and at standard motor speeds between 600 and 1800 rpm. Maximum diameter is 18 in., with overall drive length no greater than 30 in. It is available as standard unit with d-c rectification incorporated and with special control cabinet for automatic cycling. Ericsson Merritt, Inc.

24—HYDRAULIC JACK can be used horizontally

Weighing 225 lb, this 100-ton capacity hydraulic jack can be used vertically or horizontally because the oil is sealed in reservoirs. It stands just 12 in. and has

a power raise of 6⅛ in. A tandem pump permits rapid engagement of the load. The ram is brought into quick contact with the load by actuating both high speed and high lift plungers. Load can be lifted easily, company points out, using only the high lift plunger. Dual release valves in the base of the jack can be operated from either side. The base is drilled and tapped for a pressure gage, which is optional. Duff-Norton Co.

25—HELMET DEVICE lets the welder see better

Claimed to make welding a "pleasure" for welders who wear bifocal glasses is the Magna-Weld Plate, an optical accessory for welding helmet windows. For use with personal glasses, it fits behind the regular helmet filter lens where it is said to provide magnification for near

For more facts circle 605 on Reply Card →

"To Grease or not to Grease!"...

THAT IS *not* THE QUESTION WITH Lubriflush*

***U.S. MOTORS self-lubricated for normal life plus Lubriflush for extra life!**

MOTOR LIFE IS INCREASED WITH Lubriflush

Bearing failure, in most cases, is due to inadequate lubrication rather than inability to carry the load. With the exclusive Lubriflush system, U.S. motors give you extra advantages—convenient, thorough *transverse* re-lubrication. No longer is it necessary to tear down your motor to get at the bearings to do a re-greasing. Lubriflush directs transmission of new grease *transversely* from behind the bearing, through the ball race to the opposite side, expelling the old worn-out grease through the drain. In ordinary bearings, the new grease replenishes only one side of the bearing, failing to effect a complete re-greasing.

Free!

Get this 8-page full color booklet on Motor Lubrication

A real refresher course on motor lubrication. Tells all about motor bearing greasing. Fact-packed pages reveal engineering data that will amaze you. Send Coupon.

U.S. Electrical MOTORS

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U. S. ELECTRICAL MOTORS Inc.
Box 2058, Los Angeles 54, Calif. or Milford, Conn. PLE-6

☐ Send Lubriflush Booklet ☐ Send General Booklet

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

DAY "AC" Dust Filter and DAY Dual-Clone in the Stauffer Chemical Company fertilizer plant located in Tacoma, Washington

THIS DAY DUST CONTROL EQUIPMENT CERTAINLY SOLVED OUR DUST PROBLEM!

DAY Supplies Dust Control Equipment for Practically Any Industrial Need

The DAY "AC" dust filter* (shown above) captures submicron particles with 99.99+% filtering efficiency. This filter is used in many plants throughout the United States and Canada and handles a wide variety of materials including aluminum, cement, chemical, food, pharmaceutical, porcelain, radioactive, rubber and many other dusts.

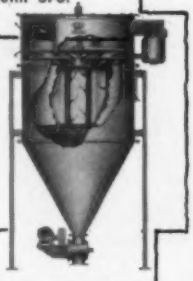
The DAY Dual-Clone (above-right) has low horsepower requirements and operates with unusually low back pressure. It requires no maintenance.

For latest information about DAY "AC" and Dual-Clone equipment write toDAY for Bulletins 559 and 49-DC.

*Licensed by H. J. Hersey, Jr.

DAY TYPE "HV" CYCLONIC SEPARATOR

A heavy gauge, welded, high efficiency cyclonic separator. The DAY "HV" has a wide range of applications. It handles abrasive or high temperature dust laden air and requires no maintenance because it has no moving parts. Available for pressure or vacuum operation. For additional information write for Bulletin 576.



DAY TYPE "RJ" DUST FILTER*

A packaged dust filter shipped completely assembled and ready to run. Provides high performance, top efficiency dust control at low cost. High air-to-cloth ratios give extra air handling capacity in small area. Furnished with or without dust fan and discharge equipment. For latest information write toDAY for Bulletin 560.

*Hersey and DAY patents applied for.

DAY TYPE "G" EXHAUST FANS

High air delivery per horsepower required. These fans are designed specifically for dust control applications. Each fan is statically and dynamically balanced before shipment. For further information write toDAY for Bulletin 471.

DAY SINCE 1881

The **DAY** *Company*

DAY SINCE 1881

SOLD in UNITED STATES by
The DAY SALES Company
807 Third Ave. N.E., Minneapolis 13, Minn.

MADE and SOLD in CANADA by
The DAY Company of Canada, Ltd.
P.O. Box 70G, Fort William, Ontario

Representatives in Principal Cities

STOP AIR POLLUTION with DAY DUST CONTROL

For more facts circle 606 on Reply Card

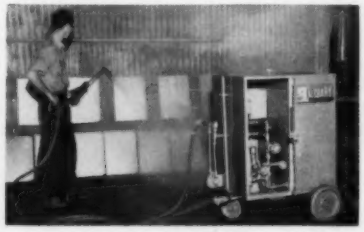
NEW PRODUCTS

(Begins on page 188)

vision throughout the entire window area. (Normally this magnification is restricted to the area viewed through the bifocal segment.) Any standard welding helmet can accommodate the Magna-Weld, according to manufacturer, and it will restore to the bifocal wearer the use of the large upper portion of his glasses. Eight focal powers are offered in the Magna-Weld from 0.75 (weakest) to 2.50. Different power lenses in the same frame may be ordered. Bulletin 33-B gives information. Sellstrom Mfg. Co.

26—STEAM CLEANER with nozzle control feature

The improved Model 51 Fireless Steam Cleaner, with flow-actuated control valves and easy-squeeze cleaning gun, utilizes live steam from a plant's regular steam lines. Its easy-squeeze gun is designed to permit operation from stations

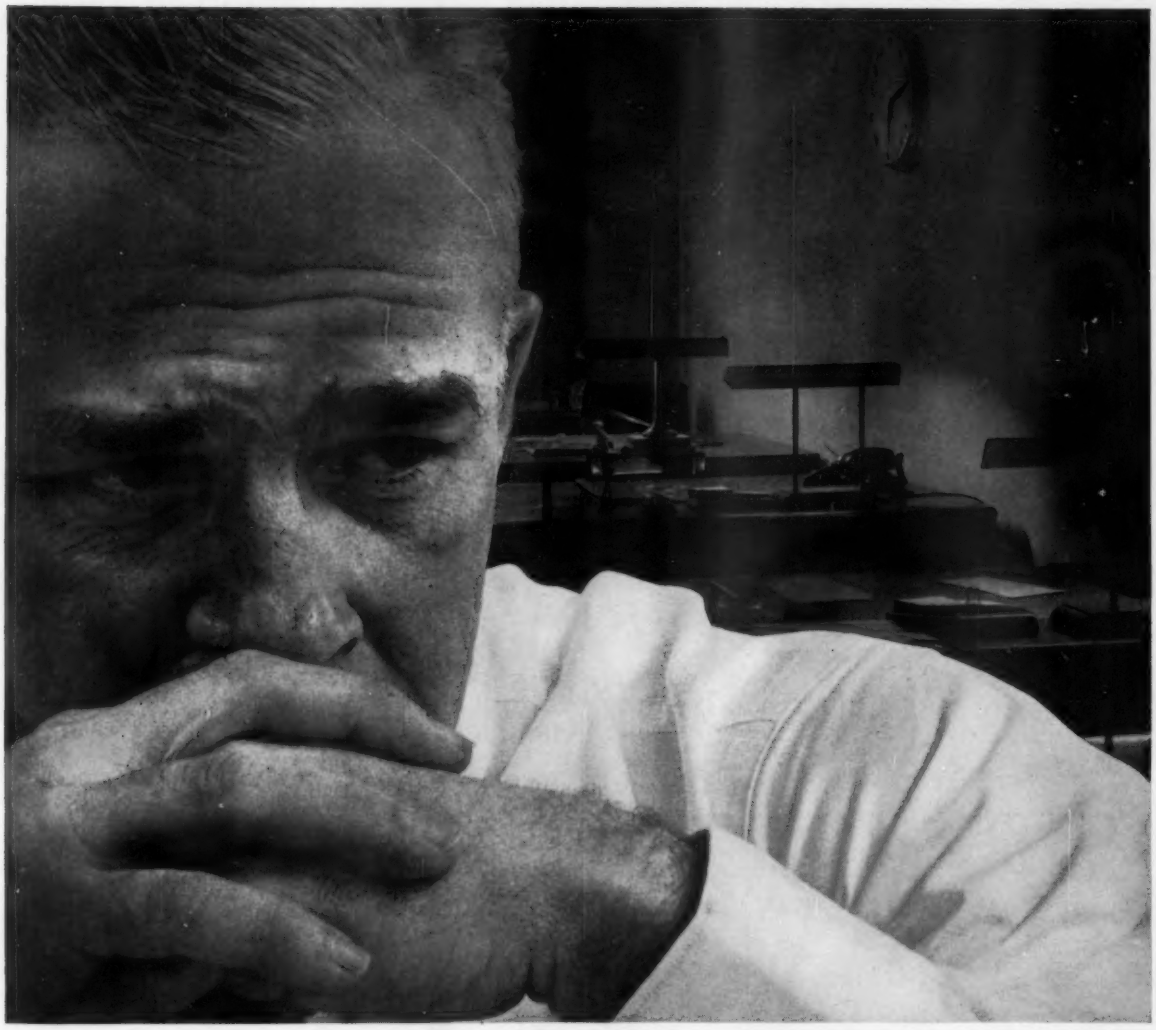


removed from the cleaner. To start flow of solution, operator simply squeezes his grip. Release of grip stops the pump. According to company, its high velocity, 212 F solution cleans hard-to-reach corners and crevices; washes away grease, gum, syrup, and corrosives from vats, racks, floors, walls, machinery; sterilizes, deodorizes, disinfects. It can be used for simultaneous degreasing and phosphatizing. Variable volume pump is utilized to balance cleaner capacity to available steam, to let user get up to 200 gph of solution at 100 psi. Malsbary Mfg. Co.

27—POWER TAKE-OFF for engines to 600 hp

This air-operated, remote controlled friction power take-off is available for use with engines up to 600 hp output in applications where a standard power take-off is used. The new unit combines company's Model PO air clutch (replacing a mechanically-actuated clutch) with the standard friction power take-off. Engagement and disengagement is accomplished by the turn of an air valve, rather than by a manually-operated handle. A rotary seal has been added to the end of the output shaft to permit actuating air to enter the clutch through a drilled passage. Air pressure of 90 to 100 psi will produce all the torque normally needed, it is explained, but 130 psi air can be utilized if required.

The new air-operated power take-off is built to SAE design standards. Pres-



Do you worry about conduit space for new control circuits

AFTER EVERYONE'S GONE HOME?

If you have a problem in getting additional control circuits in existing conduits — here's one practical way to solve it — specify and use Rockbestos PNR 600 volt control cable. It will help you get a maximum number of control circuits in a minimum amount of space. Here's why:

- Rockbestos PNR lets you pull a 12 conductor control cable in conduit which is now carrying ordinary six or seven conductor cable.
- It's 46% smaller in area — 28% smaller in diameter than conventional control cable.
- With it you save on conduit and fittings, cut installation costs.
- It's flexible from 167° to −67° F.
- It's light, easy to handle, pull through conduits.

Get the complete Rockbestos PNR story — write now for catalog which gives complete specifications and application data.

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ROCKBESTOS

PNR
Small Diameter
Control Cable

MORE THAN 10,000,000 FEET IN SERVICE

For more facts circle 607 on Reply Card

"We ran this ad 6 years ago"

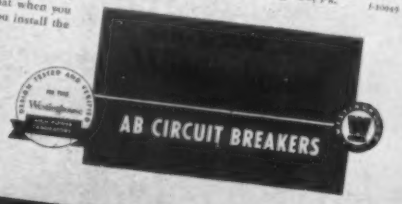
ONE OF 2500 WESTINGHOUSE CIRCUIT BREAKERS INSTALLED IN THE GULF BLDG., PITTSBURGH

24 YEARS OF CONTINUOUS SERVICE without failure, replacement or maintenance

2500 thermal-type branch circuit breakers, installed and then forgotten, in the Gulf Building, Pittsburgh, Pa., have written an unparalleled story of circuit protection. B. E. Moore, Building Superintendent, reports that after 18 years of service without failure, replacement or maintenance, these breakers were recently checked in random tests and were found to be "as good as new". On both overload and short circuit protection, they performed precisely to their original specifications. And on inspection, mechanical parts and contacts were found to be in "excellent condition".

What better proof can we give you that when you install Westinghouse Circuit Breakers you install the finest in dependable, grief-free equipment. They are miserly with maintenance time, too—when trouble is cleared from the circuit, a flip of the breaker handle restores power instantly. No running after fuses, nothing to replace, nothing extra to buy.

For assistance on any circuit protection problem, contact your nearest Westinghouse office, or write for Bulletin No. DB-29-060, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-10049



We still say...

only circuit breakers are so trouble-free

fuse replacement can be costly in outages and labor

YOU CAN BE SURE... IF IT'S

Westinghouse

For more facts circle 608 on Reply Card

NEW PRODUCTS

(Begins on page 188)

ent models are described as dimensionally identical to and interchangeable with 18-in. single and double plate mechanically engaged power take-offs and furnished with SAE 0 and 00 flywheel housings. Conversion kits are available for certain models of company's standard power take-offs. Twin Disc Clutch Co.

28—O-RINGS are suited for dry heat service

Red silicone rubber O-rings, Style 9599, are made from 70 durometer hardness stock exhibiting low shrinkage and compression set, it is announced. They are suggested for dry heat service on which many synthetic rubber compounds and natural rubbers do not maintain their rubber characteristics. According to manufacturer, these silicone rings resist oxidation, withstanding indefinitely continuous exposure to hot air and temperatures to 300 F; in most applications they will withstand, for long periods exposure to dry heat at temperatures from 300 to 500 F. They come in standard AN sizes. The Garlock Packing Co.

29—PRE-FAB BUILDINGS are steel, truss-type units

Perfection Steel Buildings are announced as sturdy truss-type with panel sidewalls and ends, available in a variety of standard sizes and styles in regular increments up to 100 ft in width, 20 ft in height and unlimited lengths. Prefabricated wall panels, with door and window frames installed during fabrication, permit quick erection, it is noted; the roof is the only area requiring sheeting in the field. The buildings may be had with industrial windows, doors, translucent roof panels, insulation, guttering, ventilators and louvers. Partitions, cranes and monorails may be had. Black, Sivalls & Bryson, Inc.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

30—BRONZE VALVES for use on copper tubing

Extension of this company's bronze globe, gate and check valves through solder-joint sockets for use on copper tubing is announced. These solder-joint valves are reported easily handled to simplify and speed installation. They are intended for use with K, L and M copper tubing in steam, water, oil and gas service. The globe valve has a service rating on steam of 150 psi, on non-shock cold water, oil and gas the rating is 300 psi. The gate and check valves have a 125 psi rating on steam, and a 200 psi rating on non-

For more facts circle 609 on Reply Card→

WHAT?
AB-I's give me greater protection?

ABSOLUTELY! You are always safe when opening or closing circuits with Westinghouse AB-I circuit breakers. The "on", "off", or "tripped", condition is clearly indicated by the position of the external handle. After circuit interruption from fault or overload, a flip of the handle restores power immediately. No fuses to replace . . . no live parts exposed.

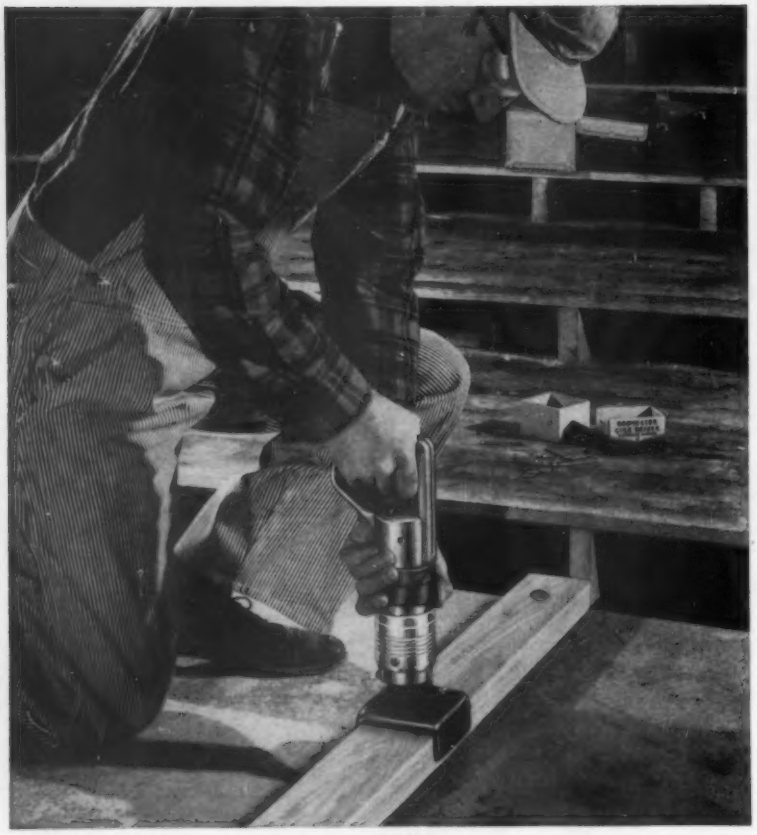
In unit circuit breakers, all operating parts are completely enclosed and insulated. A variety of AB-I enclosures, too, protect against dust, moisture or hazardous atmosphere.

Are YOU missing out on all the benefits AB-I's have to offer? If so, the time to remedy the situation is NOW! Pick up the phone and buzz your local Westinghouse distributor. Or write to Westinghouse, box 868, Pittsburgh 30, Pa. for descriptive bulletin 30-250. J-30269

YOU CAN BE SURE... IF IT'S

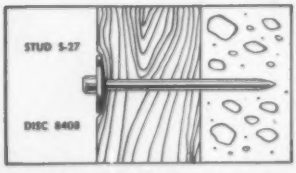
Westinghouse

Just one of *101* Stud Driver uses!



No outside power, no pre-drilling—

Anchor partition plates or furring strips in seconds with the Remington Stud Driver



The job pictured above calls for a ¼" Remington S-27 Stud with 22 caliber Power Load. Stud sets arrow-straight, solidly, permanently—no cracking of concrete or wood.

You save time, cut construction costs with this cartridge-powered fastening tool. It sets up to *six* ¼" or ⅜" diameter studs a minute in concrete or steel. Barrel change-over takes just 90 seconds. You can take the tool anywhere, use it anywhere—no wires, no pre-drilling. Over 40 Remington Studs to choose from, plus scientifically graded 22 and 32 caliber Power Loads give the versatility needed for light, medium and heavy-duty fastening.

TAKE ADVANTAGE of this modern fastening tool in your own work. Clip and mail coupon for valuable booklet.

Remington

DUPONT

STUD DRIVER

Industrial Sales Div., Dept. PE-6
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed the job and save with the Stud Driver.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

For more facts circle 610 on Reply Card

NEW PRODUCTS

(Begins on page 188)

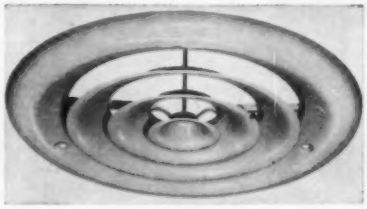
shock cold water, oil and gas. These are available in seven sizes from ⅜ to 2 in. The globe valve comes in sizes from ¼ to 3 in. Walworth Co.

31—CYLINDERS for air or oil service; 14 mounting styles

Logansquare Cylinders for air or oil service are equipped with hardened and chrome plated piston rods. Designed to comform to JIC standards, the cylinders are built in 14 mounting styles, in sizes ranging from 1½ to 8 in. bores. Cushioning is available for either or both ends, as specified. Cushioned or non-cushioned cylinders have the same mounting dimensions. Operating pressures are 150 psi air service or 300 psi oil service. Cylinders are equipped with plate steel covers, corrosion-resistant cylinder tube, block-V piston packing, U cup rod packing, and wipers. Mountings are interchangeable with those of other makes of this type cylinder. Logansport Machine Co., Inc.

32—CEILING DIFFUSER has massive, flowing lines

Available in the Model 76 (flush style, shown), and the Model 77 (step-down version), these diffusers consist of a series of wide, concentric rings in an

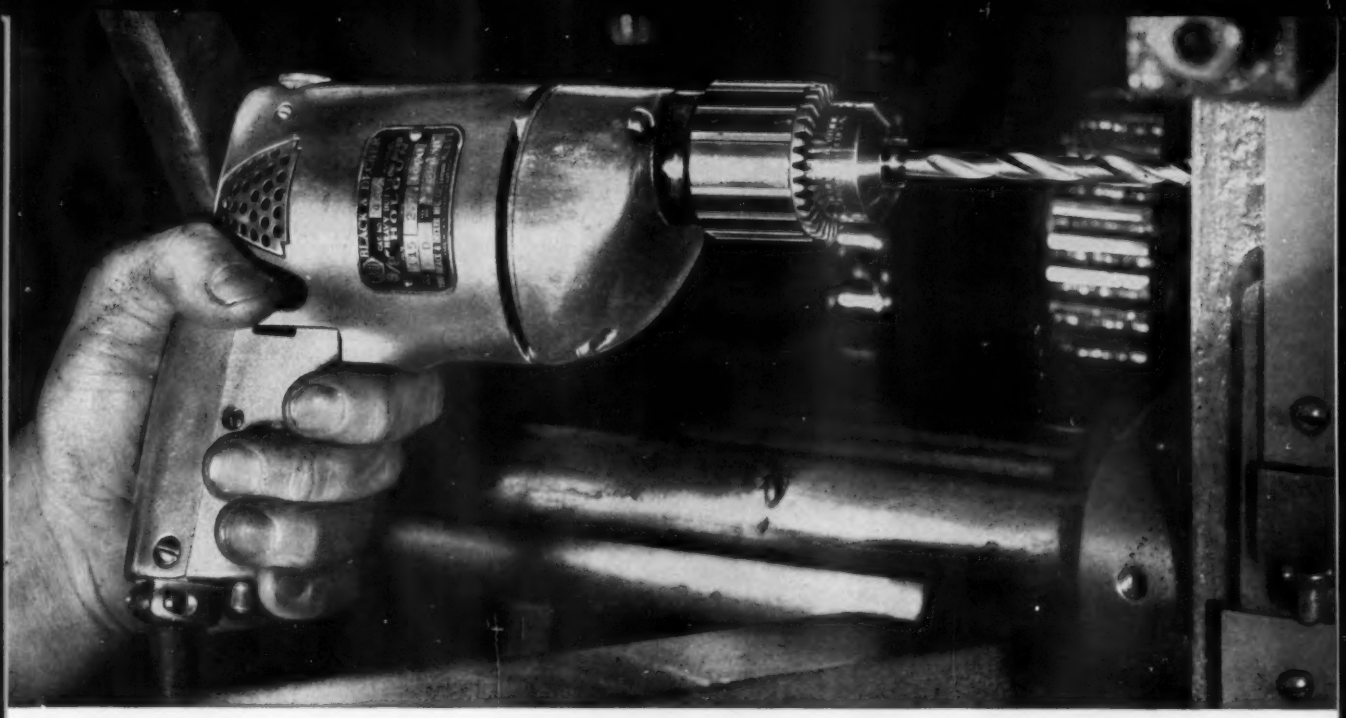


air-foil design. The anti-smudge outer ring is designed to eliminate virtually all turbulence-caused smudging. The big capacity of the diffusers eliminates special adapter fittings, it is noted. Both models are supplied in satin beige prime coat, and have self-sealing gasket applied where the diffuser meets the duct. A push-pull rod-operated damper with butterfly valve has been designed for use with the diffusers. Both diffusers and dampers are available in 6- to 14-in. sizes. Air Control Products, Inc.

33—COATING protects the skin against irritants

Reported particularly useful to those exposed to irritating chemicals and dusts, Ply No. 9 Gel consists of a plastic dispersed in gel form in a water base. When applied to the skin, the water base evaporates to leave a skin-hugging, elastic, plasticized film which, says manufacturer, is tough enough not to be penetrated by abrasive dusts, glass fibers or fine powders. This plastic film barrier is claimed impervious to such organic solvents as esters, ketones (except acetone), petro-

For more facts circle 611 on Reply Card ——→



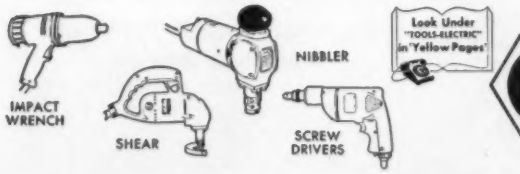
Now...an extra capacity HOLGUN® geared to speed up tough jobs!

New B&D 3/8" Heavy-Duty HOLGUN is POWER-BUILT for tremendous torque

The new Black & Decker 3/8" Heavy-Duty Holgun is specially geared and powered for your tougher jobs. Yet it's compact enough to work in close quarters. And, for all its extra capacity, it's small enough to be carried in a tool kit.

Ideal for continuous, non-stalling performance, this handy drill drives up to 3/8" twist drills, 3/4" wood augers, 1/2" masonry bits and 1 1/2" hole saws. You have your choice of 1,000 r.p.m. standard speed or 600 r.p.m. optional speed.

Try this *handful of power* at your nearby Black & Decker distributor. You'll find him listed in the Yellow Pages of your phone book. For detailed information on the world's most complete line of portable electric tools, write for free catalog No. 10 to: THE BLACK & DECKER MFG. CO., Dept. 0806, Towson 4, Maryland. (In Canada: 80-86 Fleet St., E., Toronto 2, Ontario).

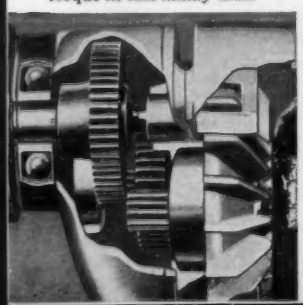


Leading Distributors Everywhere Sell

B&D Black & Decker®

Portable Electric Tools—Power-Built to set the pace

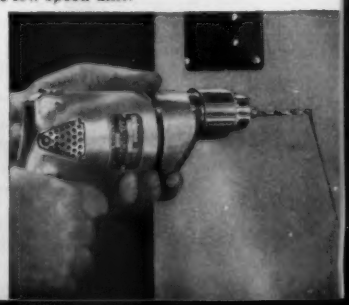
THREE STAGE GEAR REDUCTION and low speed create tremendous torque in this handy drill.



MASONRY DRILLING, demanding a tool that holds speed under load, is clean and fast with this drill.

PISTOL GRIP DESIGN, unique in a drill of this capacity, is perfect for close-quarter work.

MONEL AND STAINLESS STEEL drilling are good applications for the low speed unit.



GREENBERG — BUFFALO

NOW YOU CAN ASSEMBLE your own Herc-Alloy sling chains. No more waiting for new or rebuilt assemblies to reach you from the factory. With all components supplied by your Herc-Alloy Distributor, you can do the job yourself in minutes. Call your CM Chain Distributor today for details.

DO-IT-YOURSELF. The Hammerlok Coupling Link frees you from the traditional time lag in the procurement of sling chains. With Hammerlok, anyone who can drive a nail can assemble or rebuild a sling chain in minutes. No peening! No welding! Hammerlok is rugged...reusable...safe. Endorsed by leading alloy chain users.

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CM HOISTS AND CHAIN

HERC-ALLOY® HAMMERLOK®

For more facts circle 612 on Reply Card

NEW PRODUCTS

(Begins on page 188)

leum derivatives, and other chlorinated, aromatic, and aliphatic hydrocarbons. It is also said to be effective against epoxies, amines, polyesters, phenols, coal tars, plastic and rubber adhesives, greases and oils, lacquers, thinners. It is attacked by acetones and methyl and ethyl alcohols, company states, and being water soluble, is not recommended against water-based irritants.

Manufacturer says Ply No. 9 Gel is non-irritating, non-toxic, non-absorbing and non-drying to the skin. You wash it off with water—with or without soap. The material is suggested for operations where use of gloves or protective sleeves might impair efficiency or be resisted by workers. Or it can provide added skin protection under gloves and sleeves. It is added that an ingredient in the gel prevents spotting or corroding of finished metals by perspiration. Milburn Co.

34—PLATFORM TRUCK hauls the long loads

For handling odd-shaped and/or extra long loads, particularly where rugged duty is required, this 20,000-lb capacity low-lift platform truck, the Model L-15,

is available with electric or gasoline-electric power, has two-wheel drive and an all-wheel steer. The welded frame is of heavy steel plate. Center sill construction is used with major units attached directly to the reinforced alloy steel bars which form the sills. The platform is raised by a double-acting hydraulic cylinder. Other features noted include a rocking-link type platform lift with power lowering accomplished with inching control through a control valve. Elwell-Parker Electric Co.

35—SALT WATER PUMP of aluminum bronze

Designed to decrease the corrosive effects of salt water pumping, the Fig. 3715 Centrifugal Pump is now available in aluminum bronze. Cavitation tests are reported to show that aluminum bronze excels chromium stainless steel, standard manganese bronze, and 18-8 steels in resistance to salt water corrosion. While only 80 per cent as heavy as regular bronze, it is exceptionally tough, company states, having high impact strength and resistance to abrasion.

Other features of the pump include suction and discharge connections in the casing. Removal of casing cover permits interior of the pump to be cleaned without disturbing piping connections; and the

One of a series.

Some Things to Think About Steam Traps

...in order to get high operating efficiency and a minimum of maintenance

The gentleman who invented the wheel had a basic idea and so far no one has come up with anything better for the purpose.

If you'll pardon us for a little overemphasis on the significance of steam traps, we'd like to liken one of them to the wheel.

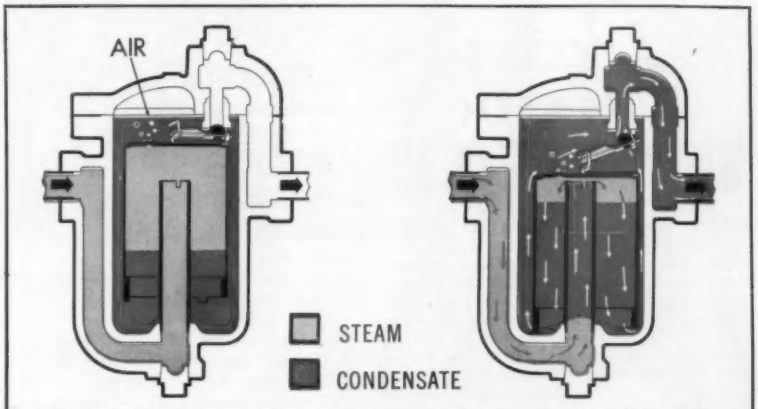
In 1911, when the first Armstrong inverted bucket steam trap model was announced to the world, or at least that part of the world that modest advertising and sales budgets would cover, it was not received with equal enthusiasm by all (especially old-style trap makers). But, like the wheel, it managed to find its way into general use. And, nothing better has ever turned up for the purpose of draining condensate. As a matter of fact, the Armstrong trap has been very widely copied. Today, there are more inverted bucket traps draining process equipment than any other kind. Of these, there are more Armstrongs.

If this sounds like the boasting of a proud parent, give consideration to some fundamental requirements not met by all traps:

1. ***A steam trap should not leak steam.*** Some traps do, you know, because of the nature of their operating principle. No steam ever gets to the Armstrong trap orifice. The valve is always water sealed.

2. ***A steam trap should vent "air" as fast as it accumulates***—otherwise temperatures are reduced and corrosion is a problem. The Armstrong trap handles air very nicely. The vent in the bucket permits air to accumulate in the top of the trap, from where it is discharged when the trap opens. For extreme conditions like draining paper machine dryers, some jacketed kettles and certain other units, the vent is sized larger for the job. And, for handling big volumes of air during warm-up, a bucket with an auxiliary thermic vent really speeds up heating.

3. ***A steam trap should discharge condensate at steam temperature*** if you want to get maximum efficiency from the unit drained. And most people certainly do. If you have to wait for the condensate to cool, it's almost impossible to maintain maximum temperatures and prevent air build-up. You guessed it—the Armstrong trap opens for water, without dependence on temperature.



Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

4. ***A steam trap should be suitable for any return system.*** The Armstrong trap works just the same whether discharging to atmosphere, back pressure or vacuum. It has been conclusively proved that flash steam resulting from use of a bucket trap does not cause a problem in vacuum return systems. The flash condenses rapidly. It's the leaky traps that cause the headaches.

5. ***A steam trap should not be a "prima donna".*** Some kinds of traps take an awful lot of care and coddling. The Armstrong trap is a rough and ready type with a hardened chrome steel constitution (valve and seat, to be exact). It cleans itself of ordinary dirt and scale without choking up. Its 18-8 stainless parts stave off rust and corrosion. It resists wire-drawing and wear remarkably well. In fact, it stays on the job longer with less attention than any trap ever produced. Unless you live in Siberia, you can probably find a user around the corner who will tell you so from experience.

6. ***A trap should not be an "orphan".*** With Armstrong traps you can *always* get prompt service and parts from nearby Factory Representatives and stocking distributors as well as from the factory.

7. ***A trap should have a guarantee.*** The Armstrong trap is unconditionally guaranteed to give you *complete satisfaction* (as to doing its job, that is). If it doesn't, you can get your money back.

If you'd like to buy some of these excellent steam traps, call your local Armstrong Representative or write **Armstrong Machine Works, 9126 Maple St., Three Rivers, Michigan.**

ASK FOR the 44-page Steam Trap Book, free on request without obligation.

ARMSTRONG STEAM TRAPS

For more facts circle 613 on Reply Card

TROUBLED

with MOISTURE
OIL VAPOR
DIRT or SCUM
in your COMPRESSED AIR LINES?
install

Dexter
AUTOMATIC
SEPARATORS

Operation of DEXTER AUTOMATIC SEPARATORS is based on the simple principle that when compressed air expands water and oil vapors in the air are precipitated. Practical application of the principle involves the three-fold technical problem of (1) getting necessary expansion without interrupting free flow of air in the Separator; (2) separating the precipitated water and the air so they can not be picked up by the flowing air stream; (3) venting the separated water and oil into the atmosphere. All-welded construction eliminates any need for future replacement parts. No cartridges or filters to replace — 98% eff.

Type A — Point-of-use Separators on service outlets in plant systems, on portable compressors. Sizes: ⅛" thru 2".

Type C — Main Line Separators equipped with shut-off cock for removal of screen for cleaning without interruption to operation. Sizes: ½" and up.

Another Dexter Preventative Maintenance Product
Send for Full Descriptive Catalog

THE LEAVITT MACHINE CO.
ORANGE, MASSACHUSETTS

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NEW PRODUCTS

(Begins on page 188)

impeller may be removed without disturbing piping. The stuffing box is on the suction side of the impeller. Pressure on the stuffing box is limited to the suction head or pressure under which the pump operates, it is explained, and this contributes to long packing life and freedom from excessive leakage. There are nine sizes from ¾ by 1 to 3 by 4 in. Goulds Pumps, Inc.

36—FORK TRUCKS with exhaust purifier units

Dynamotives — electric-driven gas-powered fork trucks with lifting capacities to 10,000 lb — are now available equipped with an Oxy-Muffler, a catalytic exhaust purifier, to reduce organic material and carbon monoxide in exhaust gases. This muffler is mounted horizontally on the back of the counterweight. Exhaust gases pass through the connecting piping to the venturi or air inlet, where they mix with the proper amount of fresh filtered air to assist the catalyst in its function. After leaving the venturi the gas mixture enters the catalyst chamber. It is in the catalytic mass that the hot gas mixture begins its reaction, it is explained, and when these gases leave, the amount of fumes, odors and carbon monoxide is reduced to a safer level. In the catalytic mass is a well containing a sensing thermocouple which registers on a meter to show how the catalyst is functioning.

When the Oxy-Muffler is used as recommended with either non-leaded or leaded gasoline, the catalyst is claimed to cut the amount of CO and hydrocarbons in the exhaust stream from 70 to 95 per cent for a minimum of 1000 hr. When its activity declines, the catalyst can be replaced on an exchange policy, it is pointed out. Automatic Transportation Co.

38—GIANT SLING, made of 3-in. diam wire rope

This giant in wire rope slings is introduced for moving heavy power generating, industrial and other equipment. Fabricated from 3-in. diam 6 by 37 Preformed improved plow steel IWRC (independent wire rope core) wire rope,

the sling has a breaking strength rated at 720,000 lb with a safe working load of 144,000 lb or 72 tons, it is announced. It features a Dualoc ending designed to eliminate tucking, crushing or distortion of the sling body. Collars are applied merely to hold the wire ending in position. Full holding power is developed by the wire rope strands of the dead end binding around and against the live end in the wrapped section. Wire Rope Div., American Chain & Cable Co., Inc.

39—BATTERY TRAY for use in hazardous areas

Development of an "explosion-proof" battery is announced for allowing electric lift trucks to be worked in many hazardous areas. In this new design, economy is combined with safe operation, it is noted, because the interchangeable safety panel can be returned to the manufacturer for reconditioning and credit. According to company, this battery carries Underwriters' Laboratories approval for use in Class 1, Group D hazardous locations. C & D Batteries, Inc.

37—A-C INDUCTION MOTORS offered in 40- to 125-hp ratings

Significant design improvements are announced for this line of a-c induction motors of 40 to 125 hp, built to new NEMA standards. They carry the trade name, Tri-Clad, already in use on company's smaller motors previously introduced in NEMA frame sizes. Since the NEMA standards assign a greater horsepower to a given frame size, these new motors feature substantial weight and space savings over previous models. For example, the 445U frame has been increased from 75 to 125 hp. Weights average 20 per cent less, or 100 to 500 lb lighter in comparabe ratings; lineal dimensions average 10 per cent less, and volume, 27 per cent less.

Advantages stressed are higher efficiency, quieter performance and reduced maintenance, in addition to weight and space savings. The latter are attributed largely to insulation improvements. The Class A system includes slot cell insulation with double-backed Mylar polyester to provide greater physical and dielectric strength. Top sticks are made of non-hydroscopic Permafil glass with higher heat resistance. The entire electrical system is designed to have a corona starting voltage well above operating voltage.

These motors come in totally enclosed and open-dripproof (pictured) models. In the latter, the one-piece cast iorn frame has a larger area enclosed than formerly, with the result that it can be used for

NEW PRODUCTS

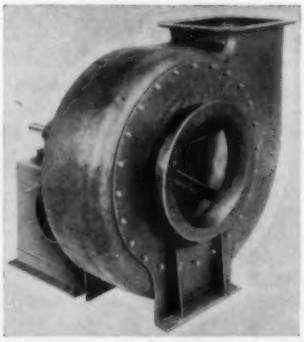
(Begins on page 188)

many applications formerly requiring a splashproof design. Double-end ventilation is provided to eliminate hot spots.

The totally enclosed, fan-cooled model is designed for maximum protection when used in chemical and other corrosive atmospheres. Gaskets are used between conduit box and frame and between the two diagonally split sections of the conduit box. The fan drives air over the motor at high velocity and pressure, and heavier ribs have been provided for greater surface cooling. General Electric Co.

40—FUME FANS of resin-bonded fiber glass

Designed for the most corrosive air-handling jobs, Type FG is announced as a corrosion-resistant, impact-resistant resin-bonded fiber glass fume fan that will not support combustion. It affords excellent chemical resistance to a wide



variety of acids, salts, gases, organic materials and other corrosives, company says, in temperature applications up to 225 F. Increased versatility, lighter weight, reasonable cost and reliability are other advantages cited. The fiber glass fan housing has integral stainless steel studs molded-in for attachment to bearing stand. Rotor is a steel wheel with exposed parts encased in a thick fiber glass. Fans are available in standard capacities up to 34,000 cfm at pressures to 10 in. static. Bulletin FI-511 gives more information. Buffalo Forge Co.

41—FILMS for industrial photographic applications

The Kodak P.B. Family includes: five new specialized films expected to increase the versatility and production-potential of industrial photographic departments. Emulsions for these new films have been coated on a polystyrene base that resists size changes during storage and processing, affording greater control over quality of finished work. Increased tolerances in photographic handling techniques for Kodalith Ortho P.B. Film, Type 3, are claimed to afford substantial savings, in that the photographer will be able to obtain high quality negatives from many

Here's how you can SAVE MONEY
on VALVE INVENTORY
on COSTLY VALVE MAINTENANCE
on PRODUCTION LOSSES due to leaky valves . . .

POWER-DRIVEN
ONE-MAN OPERATED
Dexter
VALVE-IN-LINE
RESEATERS*
will enable you to set up an effective valve maintenance program

FOR GATE TYPE VALVES
Dexter Gate Valve Reseaters are power driven through a chain and sprocket transmission. Grinding head located on a universal joint automatically seeks and holds the plane of the valve seat, regardless of its angle. Size range: 1″ thru 12″.

FOR GLOBE VALVES
Dexter Globe Valve Reseaters are power driven thru spindles mounted on radial and thrust bearings. Valves are ground from valve manufacturers' reference points. — Grinding heads for all angles. Sizes: ¼″ thru 12″.

ADVANTAGES

- Will grind stainless steel, stellite.
- Grind any valve seat, globe or gate type, regardless of its angle.
- Grind any valve in line regardless of its location, and if accessible.
- Grind a perfect seat in an average grinding time of 4 minutes.
- Reseat in the line 3 to 4 valves in less time than it takes to remove, cut, lap, replace one valve.
- Save up to 400% in man-hours.
- Perfect for welded-in valves.

**Dexter Valve-In-Line Power Driven Reseaters Replace Former Hand-Operated Dexter Valve Reseaters.*

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THE LEAVITT MACHINE COMPANY
Orange, Mass.

We repair (No.) _____ valves per year
Size range of repaired valves _____.
☐ Please have your representative call on me
☐ I would like to see your 17 minute movie (16mm)
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TITLE
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CITY
STATE

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look beyond the price . . .

you'll see that you get the most for your money in

MATHEWS CONVEYERS

A push button order filling system in which an operator at a control console directs the flow of material from 66 storage lines. Photo courtesy of Gallo Sales Co.

Most plant operating people, when they buy conveying systems, are looking for the equipment that is best for **their** plant—equipment that is designed to meet their individual requirements. They are looking beyond the price . . . looking to quality—to dependability. Mathews engineers have been designing and building conveying systems for over 50 years, and a great amount of this equipment has been applied in metalworking plants. This is why operating people everywhere have an extra measure of confidence in Mathews equipment—and why you see Mathews Conveyers in metal-producing and fabricating plants everywhere.

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CANADIAN DIVISION . MATHEWS CONVEYER COMPANY, LTD., PORT HOPE, ONTARIO.

MATHEWS

Fifty Years of Leadership in Mechanized Handling

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NEW PRODUCTS

(Begins on page 188)

of his initial trial exposures. Improved final print quality is also reported for this film. It comes in two base thicknesses: 0.005 and 0.010 in.

Autopositive P.B. Film is expected to make possible a wider variety of combinations of photo-templates and engineering drawings, however complex the originals involved. Also, both individual and composite engineering drawings may be made to a more tolerance with it, says manufacturer. The other members of the new film group, Commercial P.B. Film and Separation Negative P.B. Film, are intended primarily for color reproduction work. Eastman Kodak Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 269-270.

42—MACHINE VISE offers greater holding power

The Model P-3 Heavy-Duty Low-Boy Machine Vise has an 8½ in. jaw width and 6¾ in. maximum jaw opening with steel jaw plates in place. Removal of steel jaw plates allows another 1¼ in. of jaw opening. Weight is 194 lb. The Model P-3 is equipped with coolant run-off trough, bronze nut for the main screw and large sized main screw for maximum holding power. All working surfaces are ground, and solid bottom slide is provided to prevent chip clogging. Universal Vise and Tool Co.

43—SAFETY CONTROL for industrial, garage doors

The Model MC Electric Safety Control for garage and industrial doors combines convenience with safety. One touch on the "open" button of the control station opens door completely, freeing attendant while vehicle enters or exits. But continuous pressure is required on the "close" button until door is completely closed. Manufacturer says that supervision of the doorway is guaranteed while door is closing—if button is released at any time, the door reverses. Barber-Colman Co.

44—CHIP SEPARATOR for the screw machines

Work and chips from automatic screw machines can be separated with 99 per cent efficiency with this unit, it is claimed. The separator is designed to eliminate hand riddling and hand picking. To operate the separator, both work and chips are placed in the vibrating loading pan only 44½ in. from the floor. It is then fed over a sloping screen and subjected to an air blast from below. The work being heavier than the chips, drops

COST CUTTING IN ACTION

by Rockwell-Nordstrom

I'M ABOUT READY TO GIVE UP ... IF THE VALVES DON'T LEAK, THEY STICK. EVEN ON EASY SERVICES I HAVE TROUBLE. I'VE BEEN CALLED IN TWICE THIS MONTH ON VALVE MAINTENANCE AND DOWN TIME COSTS.
WHY DON'T YOU GIVE THOSE LUBRICATED PLUG VALVES A TRY?
I THOUGHT THEY WERE OIL INDUSTRY SPECIALTY VALVES.
SURE, THEY'RE AN OLD STAND-BY FOR THE OIL AND GAS MEN, BUT WE'VE HAD LOTS OF SUCCESS WITH THEM HERE AND IN SOME OF OUR OTHER PLANTS.
WELL, THEY'RE NEW TO ME. WHAT'S SO GOOD ABOUT THEM?
LOOK HERE: THEY CAN'T LEAK BECAUSE THEY'RE SEALED BY PRESSURIZED PLASTIC LUBRICANT IN THESE GROOVES, THE TAPERED PLUG SEATS PERFECTLY AND LUBRICANT PREVENTS STICKING.
WHAT ABOUT COSTS?
THEY COST LESS TO USE BECAUSE THE LUBRICANT STOPS METAL-TO-METAL WEAR AND THE SEATS ARE NEVER EXPOSED TO THE LINE. AND, THEY DON'T COST ANY MORE TO BUY THAN ORDINARY VALVES.
I THINK I'LL TRY A FEW ON TEST.
WE'VE TESTED THEM OVER IN OUR SECTION AND DECIDED TO STANDARDIZE ON ROCKWELL-NORDSTROM LUBRICATED PLUG VALVES... WE CAN GET THEM IN ANY SIZE AND PRESSURE WE NEED SO WE USE THEM EVERY WHERE.

ROCKWELL-
Nordstrom
VALVES

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

Rockwell-Nordstrom valves are available in a complete range of sizes and ratings in semi-steel, steel, stainless steel and other corrosion resisting metals.

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Rockwell Manufacturing Company
Rockwell-Nordstrom Valve Division
Department CS Pittsburgh 8, Pa.

☐ Please send me complete information on Rockwell-Nordstrom valves for process, industrial and manufacturing flow control.

☐ Please send me the name of your nearest distributor . . . ask him (to) (not to) call immediately.

Name_____ Title_____

Firm_____

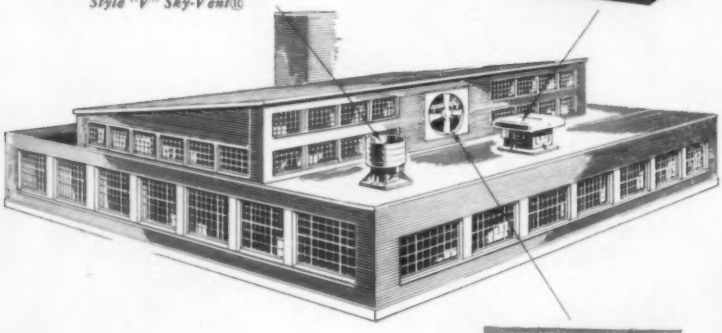
Street_____

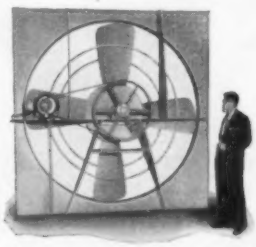
City_____ Zone_____ State_____

For more facts circle 617 on Reply Card

Style "V" Sky-Vent®

Style "H" Sky-Vent®





VENTILATE AND/OR HEAT YOUR PLANT QUICKLY, EFFICIENTLY, AT LOW COST SUMMER OR WINTER

"BUFFALO" POWER ROOF VENTILATION — No plant is modern and efficient without adequate ventilation, and it need not be a major expense. "Buffalo" Sky-Vent Roof Ventilators have proved to be one of the most reasonable and completely satisfactory solutions. They're delivered to you as ready-to-run units; thus, you save on installation cost. They handle large plant areas without need for duct systems, a further saving. They're efficient, husky and weatherproof. In combination with heater sections mounted under roof openings — or with heating coils and various damper arrangements built integrally into Style "H" stack — they can readily be used for winter supply of heated make-up air. Write for Bulletin FM-2345 and check these "Buffalo" ventilation values with the "Q" Factor*!

"BUFFALO" PACKAGE PROPELLER FANS — Modest in first cost, and the most inexpensive fans to install, "Buffalo" Package Propeller Fans provide all the desirable features for heavy-duty industrial and commercial ventilation. In 24" to 120" sizes, they deliver fresh, live air to any area from a small room to a whole plant or a giant auditorium. Very efficient at slow speeds, they are unusually quiet — and built for a lifetime of low-cost, beneficial ventilation. Ask your Engineer or Contractor about "Buffalo" Fans, Heating and Ventilating Units or Central Air Conditioning Cabinets!

** The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY
166 MORTIMER STREET BUFFALO, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

INDUSTRIAL EXHAUSTERS BELTED VENT SETS PROPELLER FANS "E" BLOWERS-EXHAUSTERS

For more facts circle 618 on Reply Card

NEW PRODUCTS

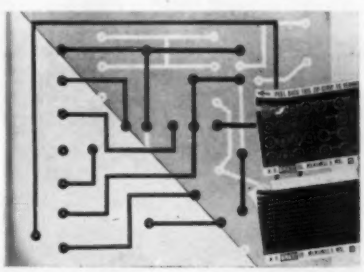
(Begins on page 188)

through the air blast and passes out a discharge chute at the side of the machine. This chute is 15¼ in. from the floor. Tote pans can catch the work, or a small conveyor can carry it away for further processing.

Chips are blown upward as they pass over the sloping screen. As the air is deflected upwards through the screened top of the extended hood, the chips drop out of the air stream and are deposited under the hood. Size of the chip discharge at the bottom of the hood is 40 by 34¼ in., and 20 in. from floor level. Use of the extended hood eliminates air blast back pressure it is noted, and keeps chips from flying out of the vibrating loading pan. Ransohoff, Inc.

45—LAYOUT TECHNIQUE cuts drafting time

Printed circuit layout time is cut with the Black 'N White line of drafting aids. These pre-cut, self-sticking shapes are for making layouts on clear or translucent film or cloth. Circuitry is laid out on both sides of the sheet. Pre-cut shapes and terminal strips made from photo-



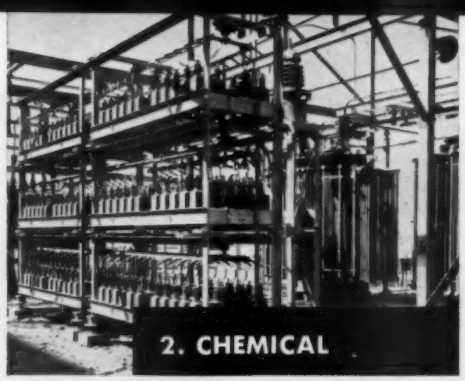
graphic tape have a white adhesive side and a jet-black, non-reflective top side. These shapes permit a technique that eliminates setting up the camera twice. Circuits are drawn on both sides of cloth or film. Then the layout is placed on a white surface for photographic reproduction. White shapes and strips on the reverse side of the layout do not register, it is explained, and after exposure the second side of the layout is photographed.

The self-sticking pre-cut shapes come in graduated sizes of 1/10 in. and fractional increments. Angles, curves, ellipses, circles can be made. Elbows, tear-drops, fillets and circles are available. The tapes and shapes are mounted on dispenser cards. Descriptive Bulletin 163 and working samples are offered. W.H. Brady Co.

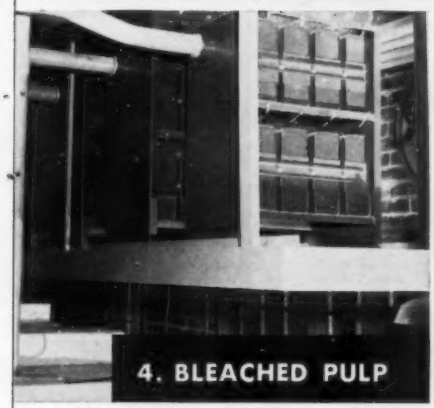
46—PUSH-BUTTON SWITCH is dust, vibration-proof

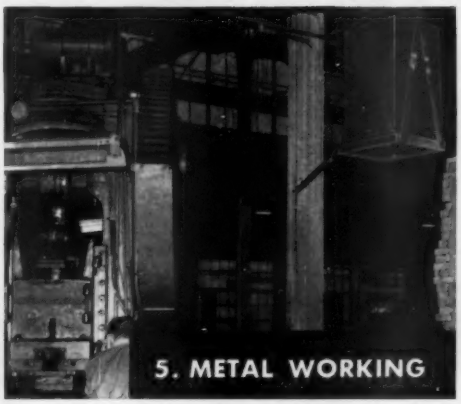
The 25-P is announced as a dust and vibration-proof, push-button industrial switch with a rating of 6 amp T, 125 v, 3 amp 250 v. Standard with 6-in. wire leads, it also can be ordered with soldering lugs or screw terminals. Damage from vibration or dust is impossible, com-

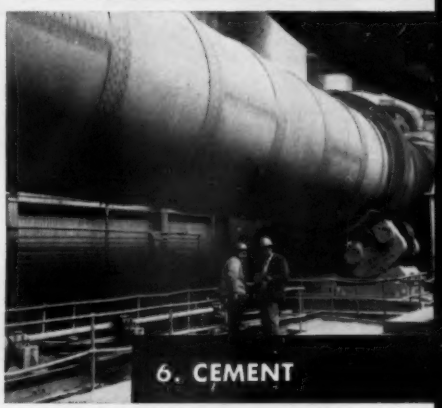
1. STEEL


2. CHEMICAL

3. TEXTILE


4. BLEACHED PULP


5. METAL WORKING


6. CEMENT

HERE'S HOW GENERAL ELECTRIC CAPACITORS ARE PAYING DIVIDENDS FOR SIX INDUSTRIALS

Here are the stories of six manufacturers who are now realizing high return on investment in terms of dollar savings, increased circuit capacity and better plant operating conditions by installing G-E industrial capacitors.

1. *Atlantic Steel Company, Atlanta, Georgia,* converted from line shaft drives to individual motor drives on its nail-making machines. Installation of 45 G-E 4-kvar capacitors at the motors helped make changeover possible by removing power factor problems arising from high motor starting torque.

2. *Shea Chemical Corporation, Columbia, Tennessee,* purchases its power on the basis of kilowatt demand with a sliding price scale for amounts over 29,000 kw. Installation of G-E capacitors helped raise power factor to 93.4% —saving Shea approximately $1250 a month in electric utility demand charges.

3. *Pepperell Manufacturing Company, Lindale, Georgia,* now saves an estimated $15,000 a year in power costs. General Electric capacitors helped raise Pepperell's plant power factor from 75% to better than 97%, enabling its utility to grant a lower rate.

4. *Riegel Paper Corporation, Carolina Division, Acme, North Carolina,* released an additional 1875 kw capacity by raising plant power factor from 82% to 95% with G-E industrial capacitors. Other benefits for Riegel were relief of overloaded load centers and postponement of the need to buy additional distribution and generating equipment.

5. *Empire Plow Company, Cleveland, Ohio,* paid off its capacitor investment of $1907 in just eight months, out of *power bill savings.* After 240 kvar of capacitors were installed, power factor rose to better than 97%. Improvement in power factor meant real savings in power bills.

6. *Peerless Cement Company, Detroit, Michigan,* needed additional power from its generating equipment because expanded facilities called for increased motor load throughout the plant. Installation of G-E capacitors raised power factor from 92% to 96%, allowing present generating facilities to handle the growing motor load and increasing the carrying capacity of previously overloaded feeders.

No matter where you are, no matter what you manufacture, General Electric capacitors may be able to give you dollar savings, increased system capacity, or improved operating conditions. Ask your G-E sales engineer how capacitors can be of specific benefit in your plant. For more information, write for bulletin GED-2978, "The Capacitor Digest," Section 441-114, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 619 on Reply Card

ONE COAT LASTS LONGER

...when it's Aluminum-Strontium Chromate paint

MAINTENANCE COSTS ARE LOWER, repainting jobs fewer and farther between—even in the most corrosive spots—when you use aluminum paint...especially paints made with Reynolds Aluminum Pigment fortified with Strontium Chromate.

Strontium Chromate gives aluminum paint added rust-and-corrosion-proofing power. It's an extra, built-in inhibitor that makes one-coat paint jobs last longer, reflect heat better, protect better.

So, to: (1) cut maintenance costs (2) guard against corrosion and rust (3) retard evaporation of volatiles (4) reduce metal heat expansion (5) reflect heat and light to keep temperatures down...ask your supplier for paints made with Reynolds Aluminum-Strontium Chromate Pigment. Or write for names of manufacturers.

Coat Your Roof With Aluminum... For Lower Upkeep, Cooler Buildings

When you coat your roof with an asphalt-aluminum roof paint or coating, you're putting on a maintenance cutting shield of metal. And, because aluminum reflects heat, you'll keep your plant as much as 15° cooler. Look for this Warranty Seal on Asphalt-Aluminum roof coatings. It guarantees an approved vehicle and at least two pounds of pure aluminum pigment in every gallon.

"By the makers of Reynolds Wrap"

Watch for Reynolds "CIRCUS BOY," Sundays, NBC-TV

The Finest Paints Made with Aluminum are made with REYNOLDS ALUMINUM PIGMENT

Reynolds Metals Company
P. O. Box 1800-PL, Louisville 1, Ky.
Please send me information on:
☐ Aluminum Paints ☐ Roof Coatings

Name_____

Company_____

Address_____

City_____ Zone____ State_____

For more facts circle 620 on Reply Card

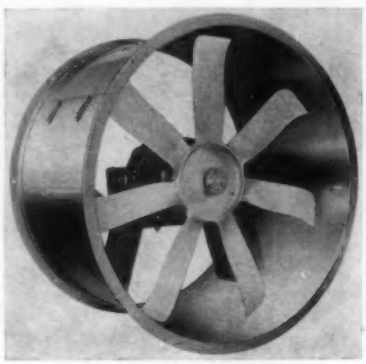
NEW PRODUCTS

(Begins on page 188)

pany says, with the molded phenolic case. Push button is ⅜ in. in diameter and finished in nickel. Other models are the 27-P, a three-way type of 6-amp, 125-v rating, and the 28-P, a two-circuit type for controlling either of two circuits. It has no off position and is rated at 6 amp, 125 v. McGill Mfg. Co., Inc.

47—INDUSTRIAL FANS for medium pressure range

SP-7 Semi-Pressure fans are designed for efficient performance against static pressure normally considered above the range of propeller-type fans. They are

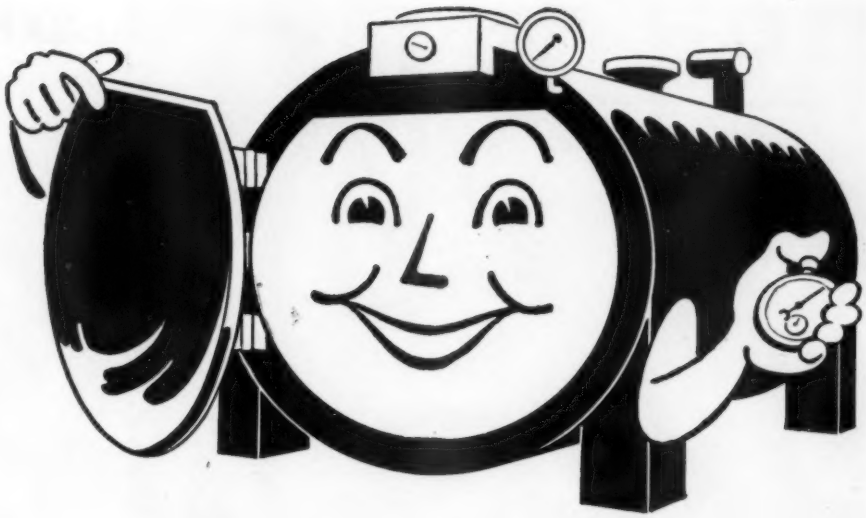


said to be especially effective in the medium pressure range up to 4 in. S.P., moving more air at slow speeds, with essentially lower horsepower requirements. Motors are said to be adequately rated for dependable operation throughout the entire static pressure range without overload. Maximum air-moving efficiency is attributed to the broader Macheta airfoil propellers, with seven blades. Available in direct-connected, direct-driven duct, belt-driven duct, Bi-Flo duct and extended shaft types, the fans are offered in a range of sizes, from 14- to 60-in. diam. Aerovent Fan Co.

48—MV FLOODLIGHTS afford choice of lighting

This line of mercury vapor floodlights is introduced to give plant engineers a wider choice of lighting equipment and enable the solution of many lighting problems with mercury. The lights come in various housings with a choice of beam spreads and candlepower. Types MVE-12, 14 and 16, for 250-, 400- and 1000-w lamps, are heavy-duty fixtures with wide or narrow beam reflector. A cast aluminum alloy housing serves to make the fixtures dust-tight and weather-proof. Protective painting is said to be unncessary under normal conditions.

Types MVB-14 and MVB-16, for 400- and 1000-w lamps, are general-purpose lights with sheet aluminum housings. They are designed for high efficiency and suggested wherever low cost installation



The Boiler that saves maintenance time

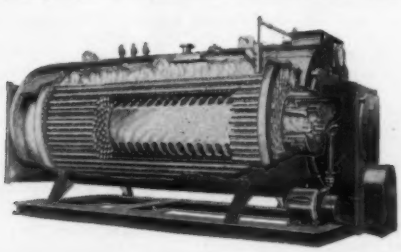
It's always easy to gain access to a Continental Automatic Boiler. For routine servicing, all doors — front, rear, and burner — are hinged. Simplified design eliminates need for refractory baffles or partitions which might burn out, leak, and cause short circuit of gases.

Low maintenance is one of the important cost-saving features of every Continental Automatic Boiler. Controls are simplified and dependable, requiring practically no attention. Heating surfaces stay clean, because of Continental's free, rapid water circulation. And openings are provided to facilitate inspection of steam and water space.

Continental's simple, practical two-pass design with the exclusive "spinning gas" feature means that all return tubes do equal work at equal temperatures, last longer, provide full access to all fire surfaces. And every Continental Automatic Boiler is fire-tested before shipment, to insure a guaranteed efficiency in excess of 80%, and a long, trouble-free, low-maintenance life. For more details, ask for Bulletin BE-3.

BOILER ENGINEERING & SUPPLY COMPANY, INC.
2 Manavon Street, Phoenixville, Pa.

The Continental AUTOMATIC BOILER



Cut-away view of typical Series A Continental Automatic Boiler, firing oil and/or gas.

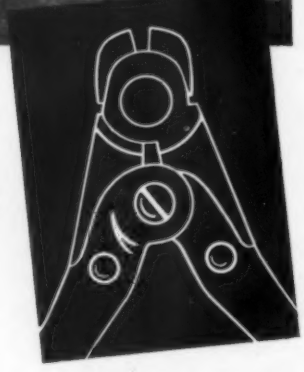
A HALF CENTURY OF BOILER MANUFACTURING EXPERIENCE

For more facts circle 621 on Reply Card

130,000 SNIPS THRU ⅛" SPRUE WITH A SARGENT CUTTING PLIER!

"Once in a while we find one of our Sargent Cutting Pliers that must have a dozen lives . . ." says H. P. Gifford, Factory Superintendent at Ralph H. Biggs Co., Jewelry Manufacturer. "This is one of the many pliers used in our investment casting department that we've had on the job for more than six months. This is far more than the usual life of a cutting plier. We have specified the Sargent #176 for this work not only because of its remarkable service record, but because its light action and small, self-opening handles make it ideal for our women operators. We use Sargent Tools of various types throughout our entire plant and have a high regard for all of them."

Sargent offers a complete line featuring parallel action compound leverage pliers, punches, and special purpose tools. Sargent will design tools to meet specific requirements. For complete information and catalogs — write



#176-S"
Heavy-Duty Spring-Action Cutting Plier

Over seven pounds cutting power for every pound applied at handles. Self-opening handles, hardened Champalloy steel jaws, induction hardened cutting edges, hardened center rivet. Nickel-plated handles.

SARGENT

Hand Tool Div., New Haven 9, Conn.

For more facts circle 622 on Reply Card

NEW PRODUCTS

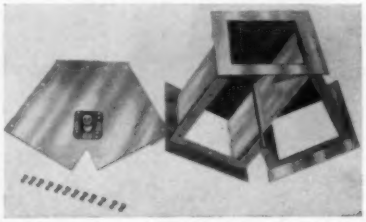
(Begins on page 188)

is desired. Types MVF and MVM are also general purpose fixtures. These have cast aluminum alloy receptacle housings and come with wide, medium or narrow beam reflectors. The former is for a 400-w lamp, and has sealed-in heat- and impact-resisting lens and rear relamping door. Type MVM, for 400- and 700-w lamps, has a front relamping door.

Type MVP is an ornamental lantern-type floodlight designed for illumination of buildings where the appearance of the lighting fixture is an important factor. Its daytime appearance is that of an ornamental streetlight. Company notes that a particular type of auxiliary ballast, designed to match the lamp type is required for each size mercury lamp. Ballasts come in normal power-factor and high power-factor types. New silver-white and gold-yellow lamps with phosphor-coated bulbs, are among lamps available for the fixtures. Bulletin 2696 gives complete data. Crouse-Hinds Co.

49—PANTLEG CHUTES can be readily disassembled

Buck-El Pantleg Chutes are standardized units equipped with flop gate, and are available for attachment to duct work, screw conveyors, bucket elevators or other machinery where a stream of

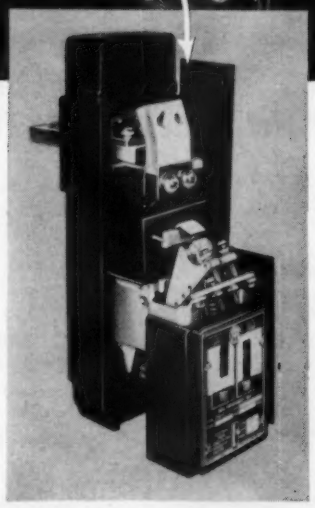


material must be diverted from one direction to another. They come in six nominal sizes from 6 to 16 in., with corresponding dimensions for opening, flange center distance and height. They are made of carbon steel, stainless steel and other materials. The side of the unit can be removed for cleaning. An optional extra is a lucite side which makes visible the actual operation of the flop gate and the flow of materials. The chute is available with a flop gate that can be worked manually through a tilt bar, or by chains to floor level, or air-operated by means of an air piston. Needle valves to control the speed of the slide are included with the chute. The Bucket Elevator Co.

50—V-S DRIVES available in ratings up to 5 hp

Improved Reeves Vari-Speed Motodrives, now in production, are reported to offer increased operating efficiency and extended ratios of speed variation. Each size comes in standard assemblies tailored to fit a wide range of space requirements. Also, motor and mounting modifications,

LOW VOLTAGE SWITCHGEAR



Here's SENSITIVE Circuit Protection

Some temporary overcurrents are tolerable; should even be permitted to occur. But sensitive circuit protection is needed to interrupt them when they persist too long or are of too high a magnitude.

The I-T-E Type OD-1 dual magnetic overcurrent trip device gives such protection. It permits temporary overcurrents, but limits them in duration and magnitude. This device will trip the circuit breaker after a predetermined interval on relatively low overcurrents or will trip instantaneously on high-magnitude fault currents. In either case you get safe, positive protection—sensitive to the needs of the circuit and the equipment on it.

For complete information on sensitive circuit protection, including selective tripping, undervoltage and other tripping devices, contact your local I-T-E sales representative. Or write for Bulletin 6004B. I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

Features of the I-T-E Type OD-1 Trip Device

PRECISION BUILT and factory calibrated to provide the highest possible accuracy in operation.

SEALED SILICONE TIMING ELEMENT. No maintenance. No oil to handle, no level to maintain, no sludging.

QUIET. Resonant vibration dampeners prevent a-c noise and wear on parts.

COMPLETELY ADJUSTABLE IN SERVICE. The delay pickup is easily adjusted from 80 to 160% of the continuous current rating. The instantaneous pickup is adjustable from 500 to 1500% of the continuous current rating. The time delay is adjustable to any of three time delay bands—minimum, intermediate and maximum.

SAFE DEAD FRONT DESIGN. Insulated knobs permit safe adjustment on a *hot* circuit breaker.

DEPENDABLE impact tripping action. The *hammer blow* movement of the time delay armature at end of timing stroke gives positive operation.

FAST RESETTING. Sensitive check valve on the piston provides quick resetting of the time delay. Repeat tripping is assured.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

IN CANADA: EASTERN POWER DEVICES, LTD.

For more facts circle 623 on Reply Card

THE FAFNIR BEARING CO., NEW BRITAIN, CONN.

"Cleanest Rooms in the World" are maintained by SPENCER Vacuum Cleaning System

In areas where delicate instrument bearings are assembled and inspected at Fafnir, complete, dust-free sanitation is not only desirable—it's absolutely essential!

These vital areas, reputedly "the cleanest rooms in the world", are Spencer vacuum cleaned several times daily. A remotely located 5 HP Spencer stationary vacuum producer and dirt separator . . . with piping to flush-mounted inlet valves . . . permits easy, "plug-in" attachment of light-weight plastic hose . . . quick, convenient cleaning that's *complete* and *dust-free*.

Whether or not *your* cleaning requirements are critical, it will pay to check on Spencer vacuum cleaning systems.

Spencer blowers force filtered, heated air through chrome piping to nozzles where bearings are dried after special rinsing.

Request Bulletin 1558 describing Spencer Vacuum.

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

OTHER QUALITY SPENCER PRODUCTS

BLOWERS

PORTABLE VACUUM CLEANERS

PNEUMATIC CONVEYING SYSTEMS

For more facts circle 624 on Reply Card

NEW PRODUCTS

(Begins on page 188)

as well as remote control features, are available. The drives come in integral horsepower ratings up to 5 hp, and follow the general pattern of company's fhp Motodrive, Size 100. According to manufacturer, the Motodrive provides a versatile tool of automation, especially when used with automatic control systems and with such accessories as magnetic brakes and tachometers. Reliance Electric and Engineering Co.

51—TRANSFER SWITCH for emergency application

This light-duty, double-throw safety switch is designed to permit connection of power from a standby generator or other emergency source when storms or other causes interrupt regular power supply. The switch is a no-fuse, double-throw three-pole solid neutral device, rated 100 amp at 120/240 v a-c. Available in a surface mounted NEMA Type 3R enclosure, it has an operating handle which can be locked in either the ON or OFF position. In addition, an accessory cable connector unit may be ordered for use with the switch. The accessory unit consists of soldered-in leads, locating washer, nut, and rain-tight closing cap assembly. General Electric Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 269-270.

52—PVC PLASTISOL for cold vertical metal surfaces

Quel-Spray is a polyvinyl chloride plastisol that can be sprayed on cold vertical metal surfaces as a protection against chemical corrosion, it is announced. It is reported particularly useful in applying chemically resistant coatings to metal parts and structures which cannot be dip coated. Quel-Spray is described as a true plastisol. It requires no thinner, says manufacturer, can be left in the gun overnight, and loses no thickness from wet to dry film when cured at 350 F. Quelcor, Inc.

53—METERING UNITS are smaller and lighter

Formfit metering units, Type FMU, up to 42 per cent smaller and 62 per cent lighter, are announced. For metering, relaying and control applications, for indoor or outdoor service, the new oil-filled units combine current and potential elements into a single fabricated steel case with cover-mounted bushings. Both single- and three-phase units are available in standard voltage ratings from 25

Hall Industrial Water Report

VOLUME 5 JUNE 1957 NUMBER 3

Water Causes Trouble Everywhere

We in the United States do not have a corner on problems connected with water. Consequently, Hall Laboratories through the years has become international. Hall staff engineers now assist in the solution of water problems the world over, working with plants from Newfoundland to Chile and from the West Indies to Europe and the Middle East.

Trouble Shooting In Venezuela

When a Venezuelan utility plant fired up a temporarily idle boiler for service, the operators were surprised to find that a number of tubes were leaking. Further inspection revealed that they were badly pitted.

The surprise of the operators was understandable because boiler water analyses during the work week for the previous 18 months had shown adequate concentrations of alkalinity and sodium sulfite for prevention of corrosion. Furthermore, tests showed dissolved oxygen in the feedwater to be zero.

Hall staff engineer J. E. Summerville made a hurried trip to the plant to determine the cause of the trouble. The pitting nature of the corrosion belied the absence of dissolved oxygen from the boiler feedwater and the presence of adequate amounts of sodium sulfite in the boiler water. Hence, his investigation was directed toward finding out how oxygen was getting into the boilers.

The source of oxygen was quickly located. All boilers were shut down each week end. Air could enter the steam drums when steam pressure dropped. Moreover, with no steam available for the deaerator, any water pumped into the boilers was not deaerated. No water testing was done over week ends.

Changes were instituted immediately to avoid pumping undeaerated water into the boilers and to build up high concentrations of sodium sulfite in the boiler water for week ends. The problem which seemed so puzzling was simply diagnosed and solved because of the specialized experience of the Hall Engineer.

Water is your industry's most important raw material. Use it wisely.

Dirty Cooling Towers Impair Efficiency

Scale formation in the oil coolers and heat exchangers of the recirculating cooling system for diesel engines caused frequent outages and inefficient performance of equipment at an electric generating plant in Haiti. Scale had even formed in the cooling towers.

Untreated city water was normally used as makeup for the cooling system. When it was in short supply, however, water from deep wells was substituted. Analyses indicated to Hall staff engineer A. M. Henricks that both waters were scale-forming in character. He recommended that the water be stabilized against deposition of scale by threshold treatment with Calgon,® supplemented with some sulfuric acid to hold alkalinity of the recirculated water at a satisfactory level.

Algae and bacteria growths in the system were prevented by disinfection with calcium hypochlorite.

Again, trouble-free operation was simply accomplished because of the specialized knowledge and experience of the Hall Engineer.

All Not Left to Kismet

Heavy iron oxide deposits in the boilers of a large Middle East oil company caused many tube failures and costly unscheduled outages.

A study of the problem showed the source of the iron oxide to be corrosion in the condensate return system. Since carbon dioxide in the steam was a factor in the corrosion, some consideration was given to decarbonation of evaporator feedwater with sulfuric acid. However, this would have involved a substantial investment for equipment as well as careful chemical control and operation. Hall staff engineer A. M. Henricks accordingly recommended the use of Hagafilm,® which effectively controls corrosion of metal surfaces contacted by condensate even though the condensate contains dissolved carbon dioxide and oxygen.

The Hagafilm feed did all that was asked of it. It stopped the corrosion and cleaned up the system so effectively that the plant reported "deposits in the boilers have been so light during recent inspections that semi-annual inspections have been discontinued."

Cemented Relations

The heading might apply to the harder-than-concrete complex aluminum silicate scale which was causing loss of boiler tubes in a Colombian oil refinery.

Lake water used in the boilers contained a lot of iron. Coagulation with alum followed by ineffective filtration did not remove the iron. Instead, a considerable amount of aluminum from the alum passed through the filters in the water and went to the boilers causing formation of the complex aluminum silicate scale.

A solids-contact clarifier which had been installed to treat water for a recirculating cooling system was not being used. At Hall's recommendation a few mechanical changes were made to adapt the equipment to treatment of the boiler feedwater. This made possible successful clarification and removal of iron from the water without contaminating the effluent with aluminum.

Now, "cemented" applies to relations between Hall Laboratories and the plant rather than to the scale in the boilers.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information, write, wire or call Hall Laboratories, Division of Hagan Chemicals & Controls, Inc., Hagan Building, Pittsburgh 30, Pa.

Hall Laboratories—Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

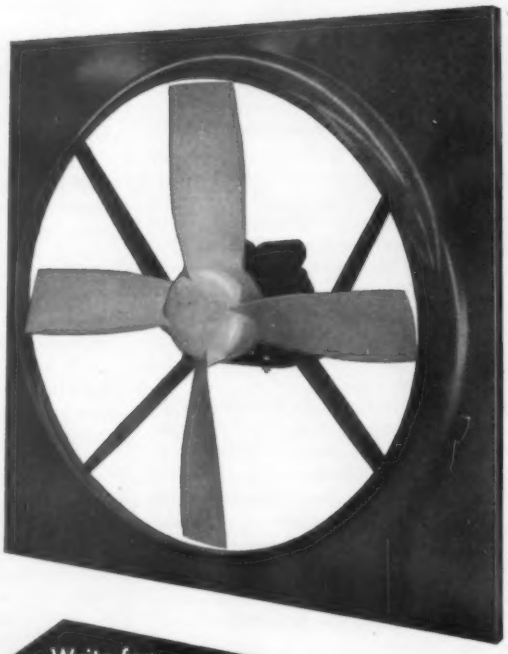
For more facts circle 625 on Reply Card

New fan combines power with quietness

R&M-Hunter "Q" Type Fan

For plants, offices, schools, stores, laboratories, restaurants

- Totally enclosed single phase permanent split capacitor motor.
- One-piece cast aluminum propeller in modern airfoil design.
- Easily installed heavy steel frame with high-efficiency entrance ring.
- Certified air deliveries from 3100 to 10800 CFM.
- Backed by two of the oldest and best known names in ventilating fans.
- Direct drive eliminates horsepower loss from belt friction.



Write for complete data and prices

R&M HUNTER

HUNTER DIVISION — ROBBINS & MYERS, INC.
2444 Frisco Ave., Memphis 14, Tenn.
Manufacturers of a complete line of fans for industrial, commercial and residential service.

ATTIC FANS

AIRSPREAD FANS

CEILING FANS

KITCHEN RANGE HOOD

EXHAUST FANS

For more facts circle 626 on Reply Card

NEW PRODUCTS

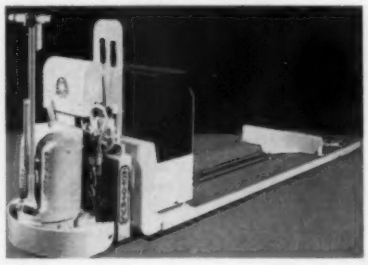
(Begins on page 188)

through 69 kv with primary current ratings of 10/20 through 400/800 amp.

All ratings have series-parallel primaries to provide double current ratios. Current ratios can be readily selected by an oil-immersed switch at the top of each primary current bushing. The switch is an externally-operated, no-load device with an indicator, visible from a distance, which shows the type connection. The tank is welded to the base, making a completely sealed unit. Compact arrangements of core and coils and elimination of condenser-type bushings result in a small lightweight unit with low oil content, the manufacturer points out. Westinghouse Electric Corp.

54—PLATFORM TRUCK handles long, flat loads

This walkie-type platform truck, with pusher bar for self-unloading, is especially designed to permit loading of freight cars and highway trailers with sheet steel, plywood, building materials. No pallet or other load supporting device



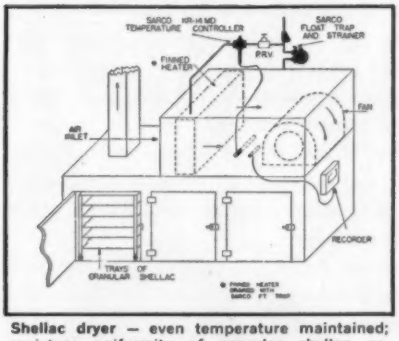
is needed since the load rides on the truck's platform. Loads are preassembled on dunnage and the truck is driven beneath. The platform is raised under the load for pick-up. After positioning in the freight car, the hydraulically-actuated pusher bar is used to push the load onto the floor.

Because of heavy loads and small underclearance two special load wheel assemblies are used. Each consists of four wheels, two in front and two behind, supported on a pivoting shackle which permits compensation for floor irregularities. Two auxiliary wheels which normally ride clear of the floor are provided to permit crossing sills and dock plates. The standard truck is 135 in. long, 39 in. wide. The standard platform has a lift of 4¾ in. and is 96 in. long. The pusher bar has a travel of 85 in., and is claimed capable of pushing 8000 lb. The truck has an 18-v power unit. Moto-Truc Co.

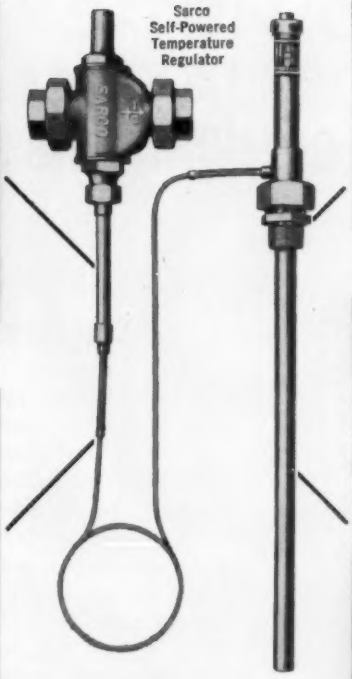
55—CLEANING TOOL swabs inside of gage glasses

This improved tool uses brushes to clean the inside of liquid level gage glasses. It consists of a stainless steel rod with a bronze T handle, operating inside a stainless steel tube. The wiping mechanism

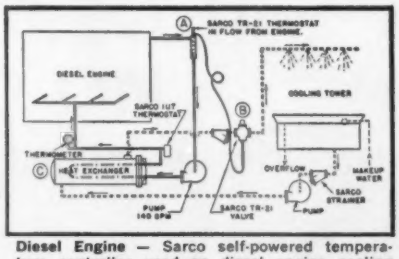
Water storage tanks — Sarco self-powered temperature controls on service water storage tanks from twin heaters.



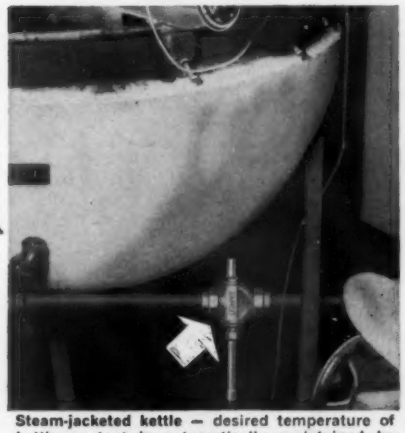
Shellac dryer — even temperature maintained; moisture uniformity of granular shellac accurately controlled — by Sarco self-powered temperature control.



FOR YOUR INDUSTRY
Chemical Processing • Metalworking
Food • Textile • Paper
Oil Refining • Others



Diesel Engine — Sarco self-powered temperature controller used on diesel engine cooling system. Also ideal for compressors.



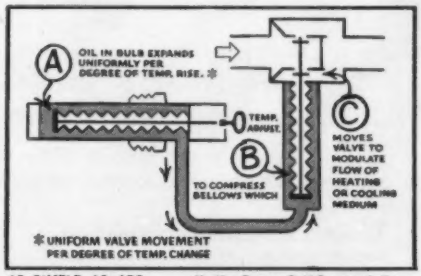
Steam-jacketed kettle — desired temperature of kettle content is automatically maintained by Sarco self-powered temperature control. Steam waste, uncertainty of manual control eliminated.

How to get Automatic Temp. Control that's simple, dependable, inexpensive

HERE'S the way to get rid of uncertain, time-wasting manual temperature control . . . *throughout* your plant. And without investing in complicated, costly temperature control equipment.

These SELF-POWERED Sarco controls are inexpensive, simple, dependable, accurate. They can be used for 85% of your jobs. ½" size costs only about $100!

Thousands of these Sarco controls are giving dependable, accurate service for firms such as Colgate-Palmolive Co., Sinclair Refining Co., Swift and Co.


A
OIL IN BULB EXPANDS UNIFORMLY PER DEGREE OF TEMP. RISE. *
TEMP. ADJUST.
B
TO COMPRESS BELLOWS WHICH
C
MOVES VALVE TO MODULATE FLOW OF HEATING OR COOLING MEDIUM
* UNIFORM VALVE MOVEMENT PER DEGREE OF TEMP. CHANGE

AS SIMPLE AS ABC . . . that's Sarco Self-Powered Temperature Control. A thermostat with capillary tubing and a valve . . . that's all there is to it!

SARCO SELF-POWERED TEMPERATURE CONTROLLERS
—need no power source

1. Self-Powered — no compressed air or electricity needed.
2. Easy to install — by any pipe-fitter.
3. Self-contained — no exposed mechanism. Packless valve.
4. Simple — no gadgets that take a technician to read and repair.
5. Not affected by cross-ambient temperatures or elevation of the bulb.

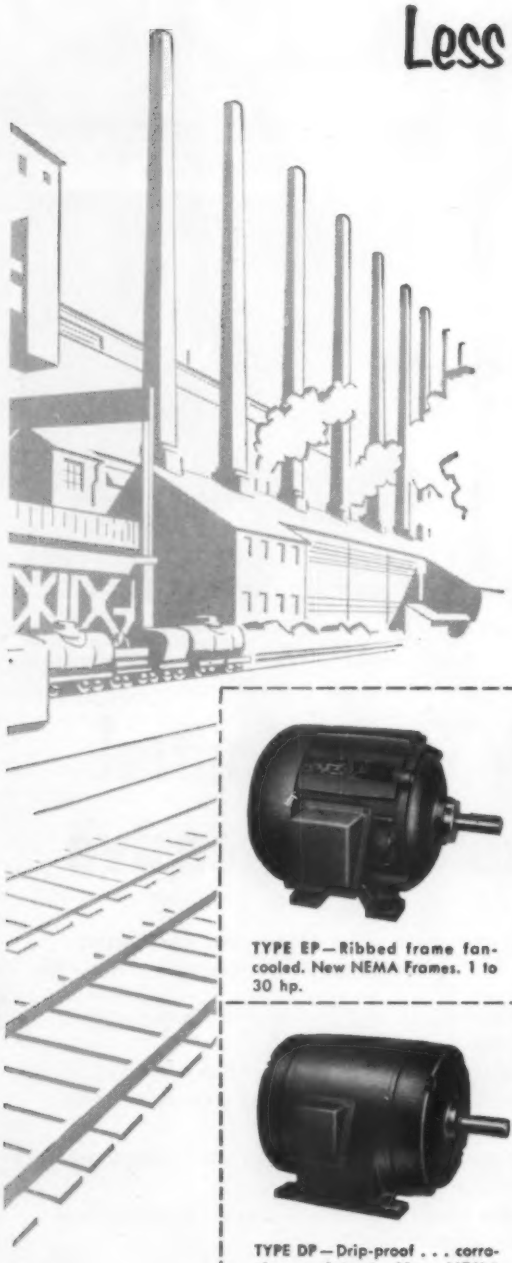
Send for Bulletins: No. 620 — Self-powered Temperature Controls. No. 710 — Self-powered Cooling Controls. No. 1025 — Electric Indicating Temperature Controls. Sarco Company, Inc., Empire State Bldg., New York 1, N. Y. 2208-B

SARCO

Automatic Temperature Control

ELECTRIC INDICATING AND SELF-POWERED TEMPERATURE CONTROLLERS • STEAM TRAPS • STRAINERS

For more facts circle 627 on Reply Card



Less down time...lower upkeep...

WITH

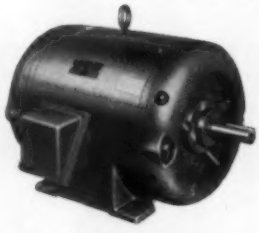
Wagner Protected Type Industrial Motors

Wagner protected type motors lower your maintenance costs . . . cut down time, because they are designed for use where operating conditions demand EXTRA protection—for bearings or windings, against corrosive vapors or abrasive dirt, in explosive atmospheres or exposed outdoor locations.

Each of these Wagner Motors will give completely dependable performance in its specific application—with a minimum of maintenance. All these motors can be relubricated, when necessary, for longer bearing life.

A Wagner field engineer, expert on motor applications, will be glad to help you choose the *right* motors for your specialized needs. Just call the nearest of our 32 branch offices, or write us for Bulletins on Wagner Industrial Motors.

TYPE EP—Ribbed frame fan-cooled. New NEMA Frames. 1 to 30 hp.

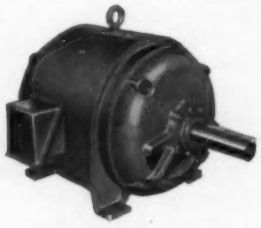


TYPE EP—Totally-enclosed fan-cooled. Corrosion-resistant frames. 40 to 250 hp.

TYPE JP—Fan-cooled . . . Explosion-proof. Cast iron frames. 40 to 250 hp.

TYPE DP—Drip-proof . . . corrosion-resistant. New NEMA Frames. 1 to 30 hp.

TYPE DP—Drip-proof. Cast iron frames. 40 to 125 hp.



TYPE RP—Drip-proof. Fabricated steel frames. 125 to 500 hp.

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M37-8

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ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

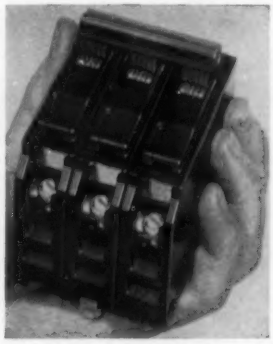
For more facts circle 628 on Reply Card

(Begins on page 188)

consists of two commercially available brushes which screw into a holding plate. These brushes are designed to clean to the very ends of the visible glass. The tool is inserted into the gage with brushes vertical. With the handle held in position, the tube is pulled down against a spring and rotated 180 deg. Releasing the tube then locks the brushes in a horizontal position ready for cleaning. In standard 3-ft length, tool costs around $31.00. Other lengths are available. Jerguson Gage & Valve Co.

56—BREAKER for lighting-distribution panels

This low-cost three-pole, 50-amp 240-v frame circuit breaker is reported to permit major cost savings for combination lighting and distribution panels. It is designed to extend usefulness of QO circuit breaker panelboards and load-

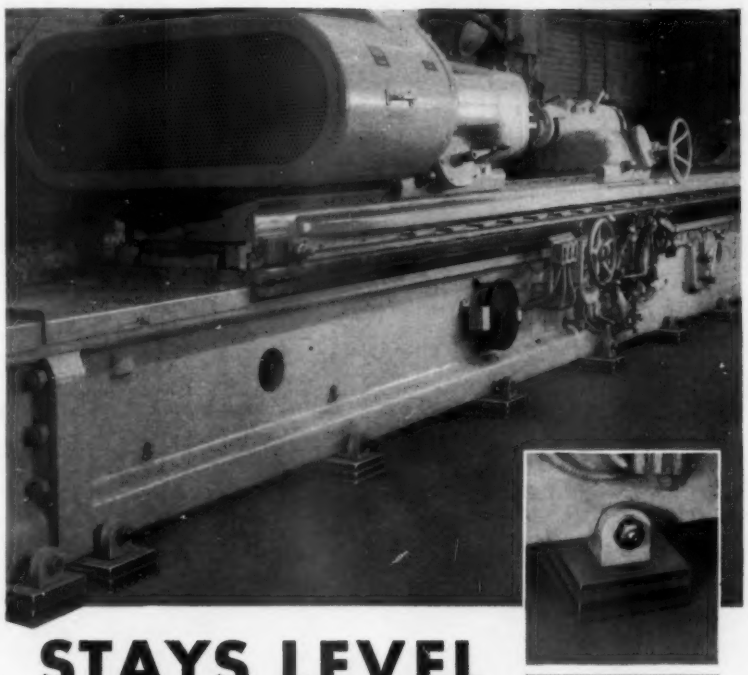


centers for three-phase, three- and four-wire, 240-v a-c circuits as well as single-phase, two- and three-wire circuits. Manufacturer says the sequence bus connections permit any adjacent single poles to be changed to double poles on any bus, as well as three poles on three-phase arrangements. It is available in five 240-v ratings from 15 to 50 amp. The breaker's operating mechanism is quick-make, quick-break with a thermal and independent magnetic trip. It is noted that this breaker permits use of less expensive panels and loadcenters on most combination lighting and motor loads without sacrificing safety or maximum performance. The Square D Co.

57—SENSING SYSTEM gives liquid level readings

This liquid level sensing system is designed to provide accurate and trouble-free indication of liquid level. Manufacturer says the system is capable of operating a light to indicate whether liquid is above or below a certain level; can actuate a control or start and stop pumps; or may be used to operate valves to transfer liquid from one tank to another. Resistance to shock, vibration and corrosion; no moving parts; a-c or d-c

45-TON GRINDER INSTALLED ON Air-Loc® 4·17·4

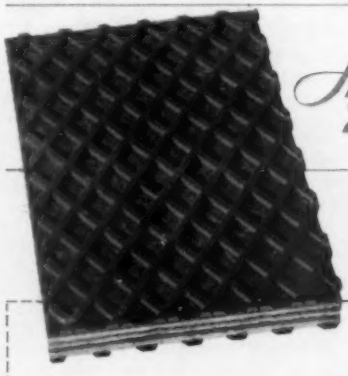


STAYS LEVEL TO .0005"

Insert shows use of Air-Loc and leveling plates. No bolts or cement needed.

This Norton Grinder, installed on 26 AIR-LOC mounts, is regularly checked for level at 3-month intervals . . . and always holds the .0005" level required by manufacturer's specifications, with no adjustments necessary.

Jigborers, grinders, lathes . . . all of your fine tolerance precision machines . . . should be installed on AIR-LOC to safeguard the accuracy originally built into them by the manufacturers.



Air-Loc® 4·17·4

You get a permanent precision installation with patented AIR-LOC mounts that *Resist* oil, water and alkali, *Permit* easy leveling, *Eliminate* need for bolts or cement, *Hold* machines in place, *Reduce* transmitted vibration from the floor.

Return Coupon for Air-Loc Samples and Booklet.

AIR-LOC DIVISION
Clark-Cutler-McDermott Company
Franklin, Massachusetts

NAME..... TITLE.....
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COMPANY.....
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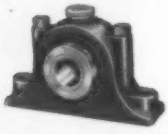
CITY..... ZONE..... STATE.....

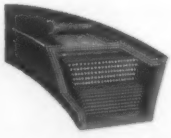
For more facts circle 629 on Reply Card

DODGE PRODUCTS you should know

FLEXIDYNE
THE DRY FLUID DRIVE
100% efficiency at full load!



DODGE-TIMKEN
America's Quality Pillow Blocks!



SEALED-LIFE V-BELTS
The life is sealed in!

•

Write for Bulletins!

- Flexidyne Dry Fluid Drives and Couplings. Bulletin A-640-A.
- Roller Bearings. Load ratings, dimensions, etc. Bulletin A-638.
- Sealed-Life V-Belts. Complete data and sizes. Bulletin A-606-A.

DODGE MANUFACTURING CORPORATION
2700 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

For more facts circle 630 on Reply Card

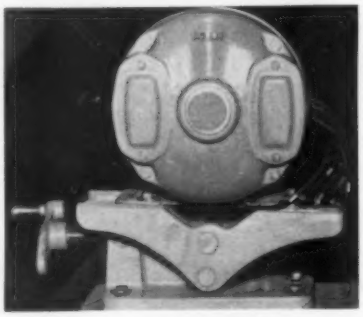
NEW PRODUCTS

(Begins on page 188)

power; and low power consumption are features cited. It operates in hydraulic fluids and hydrocarbon liquids, from 75 C to –55 C or their pour points, whichever is higher. In some applications, company says, liquid temperatures higher than 75 C can be handled. Systems can be designed for many liquefied gases, including liquid oxygen, liquid nitrogen, liquid hydrogen and liquid anhydrous ammonia. Simmonds Aerocessories, Inc.

58—MOTOR BASE compensates for belt tension

This tilting motor base is claimed to pull double duty with any variable speed pulley. The base compensates for belt tensions when speed changes are made

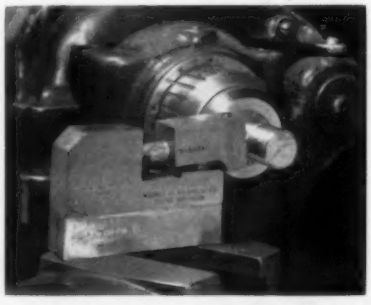


while the machine is running, company explains, and it also makes belt changing easier. The unit features one size base for all fractional horsepower motors. Because of its tilting movement it requires only minimum space for adjustment. Actual base size is 5½ by 7½ in. Correct belt tension and alignment are maintained by a handwheel screw adjustment which tilt angle. Lovejoy Flexible Coupling Co.

59—TOOL HOLDER saves time in cutting threads

Spee-D-Thred is a threading tool, designed for fast, efficient single point threading, on a reversible engine or turret lathe. It is made up of a ductile iron main base, an upper part (called the upper anvil) with a square hole for fastening the cutting tool bit, and a lower anvil pressed into the main base. In the upper anvil is a tapered hole which fits onto the tapered cone of the lower anvil. The angle of the cone is such to allow variations of the upper anvil on the return stroke and to prevent transfer of vertical cutting forces to the ball end rod, which slides in a hard tube, also part of the main base.

During the cutting strong, the anvils are held in place by the cutting forces and are the same as a solid tool. During the return stroke (illustrated), the spindle is turning in the opposite direction, the forces are upward and the tool bit and upper anvil are forced up and the heel of the tool rides on the portion of



the thread already cut until it reaches the end, when it drops in position for the next cutting operation. Either the cross slide or the compound may be used to feed in the tool for succeeding cuts. Micro switches may be used to reverse the lathe, or the regular reversing button or mechanical means.

According to manufacturer, the Spee-D-Thred will save from 50 to 70 per cent of the time normally used on single point threading, operator fatigue is

60—WATER CHILLER requires no field refrigerant piping

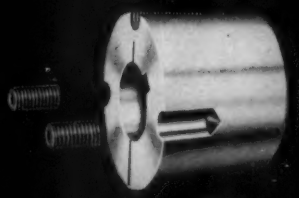
This packaged water chiller, availabe in 3- and 5-hp sizes, requires no field refrigerant piping, it is announced, and is designed to meet commercial and industrial requirements. The compact unit consists of water chiller, compressor, water-cooled condenser and controls—all factory assembled into an insulated, bonderized steel cabinet requiring only 8.3 ft of floor space. Unit is equipped with automatic control which includes an on-and-off switch; a thermometer than can be set to maintain desired water temperature; a freeze-up thermostat, factory-set at 38 F, to prevent water freezing within chiller; and a magnetic starter that controls compressor operation. Wired at factory, the unit can operate on three-phase, 60 cycle, 208/220 v or single-phase, 60 cycle, 230 v. The field serviceable hermetic compressor is a horizontal shaft type, mounted on rubber vibration absorbers, and has suction gas-cooled motor. The shell and coil condenser has water connections to pipe in field for either single or double circuit. Worthington Corp.

61—FAUCET KIT holds the parts for repair jobs

The No. 100 Giant Handy Andy contains some 1080 parts—an assortment covering repairs for practically any faucet or small size valve. Includes all sizes of a special, Fiberglas-reinforced faucet washer and a new type of Monel, self-locking screw. It also contains required sizes of six-ply top bibb gaskets, heavy brass friction rings and graphite asbestos bonnet packings. The two lengths of self-locking screws and a 10-24 tap included are said to take the place of 30 screw sizes otherwise required. Of heavy-gage metal, the kit has a locking cover and a carrying handle. A chart on the inside describes contents of each compartment for easy selection. J. A. Sexauer Co., Inc.

IT'S TAPER-LOCK

—IT'S INTERCHANGEABLE!



TAPER-LOCK SHEAVES

TAPER-LOCK SPROCKETS

TAPER-LOCK COUPLINGS
Rigid—Flexible—Chain

TAPER-LOCK STEEL CONVEYOR PULLEYS

The New Way to Cut Costs

Save time in mounting. Cut down-time on production machines. Standardize with Taper-Lock, the *interchangeable* bushing. The same Taper-Lock bushing fits sheaves, sprockets, couplings, conveyor pulleys. That means smaller inventories of power transmission parts. And it means quicker changes when necessary to keep production lines running!

Taper-Lock bushings are available in a range of sizes which makes it easy to change from one size shaft to another. Taper-Lock products slip onto the shaft quickly — hold with the firmness of a shrunk-on fit—come off easily, without shock to bearings or machinery. You'll profit by standardizing on Taper-Lock.

DODGE MANUFACTURING CORPORATION
2700 Union Street Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new methods. Look for his name under "Power Transmission Machinery" in the yellow pages of your classified telephone directory — or write us.

For more facts circle 631 on Reply Card

PIPEMASTER

"I've been around pipes and pipe tools for the better part of a century! Long enough to give some advice. I want to tell you that there's no wrench like the Pipemaster wrench! Yessir! I've been using this wrench because it's *easier* to work with. The Pipemaster people thought up a kind of double-action spring that makes these jaws really grip and release. And, these balanced heavy-duty Pipemasters are lighter weight without sacrificing one bit of strength!"

You, too—look for Erie PIPEMASTER'S completely redesigned line of hand pipe tools—wrenches (all sizes from 6" to 48"), cutters, vises, stands, tubing cutters, and threaders. All parts of all Pipemaster tools are factory job-tested and unconditionally guaranteed. At your supply house or write:

See us at Booth No. 1010 at the Plumbing Show in Dallas

ERIE PIPEMASTER

ERIE TOOL WORKS

ERIE, PA., U. S. A.

IN CANADA—ETF TOOLS Ltd. St. Catharines, Ont.

For more facts circle 632 on Reply Card

NEW PRODUCTS

(Begins on page 188)

greatly lessened, and work spoilage due to cross threading is eliminated. It is pointed out that the Spee-D-Thred can be used only on lathes with reversible spindles. It costs around $50. Spacers to adapt it to each lathe can be had at extra cost to plants not wanting to make their own. A brochure gives further details on the tool. Warner Development Co.

62—DRUM RECORDER monitors work being done

Model MDjr is a compact "operations" or "events" recorder and consists of a drum which rotates at speeds from 4 min to 24 hr per turn (as ordered). It is used to record graphically when a machine or device is operating or when an operator is producing. No ink is used. A stylus rests against the chart paper

with its adherent layer of white opaque wax crystals—pressure of the stylus exposes the contrasting color of the paper beneath.

The stylus produces a slight spiral tracing on the chart. The lead screw is also subject to an axial motion from the magnet responding to the input signal to cause the vertical line. By this means, more than 400 linear inches of recording can be had on a waterproof chart only 6 ft by 14 in. When 24-hr rotation model is used, any given constant of successive days is instantly comparable since they line up vertically. Motors operate on 115 or 220 v a-c. Styli coils are for 6 to 220 v a-c or 6 to 120 v d-c. A 5000-ohm electronic coil is available. An advantage cited is that an operator can see his production record as it is being made by him. The recorder costs about $60.00 with 100 sheets of paper. Gorrell & Gorrell.

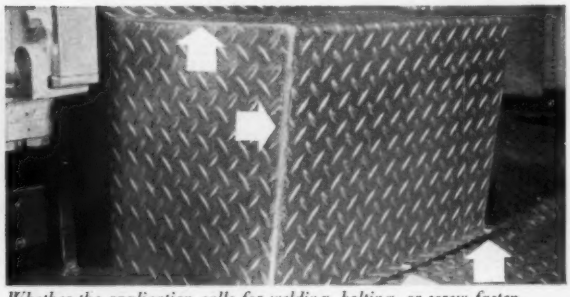
63—ADHESIVE joins fabrics, porous materials

Ray-Bond Adhesive R-87001 is described as a rubber base type adhesive with instantaneous grab—a property of particular importance in textile mill applications where ends of ribbons, elastic bands and fabrics are joined without slowing production. This adhesive is claimed strong enough to permit joining ends of material without overlapping; its tensile strength

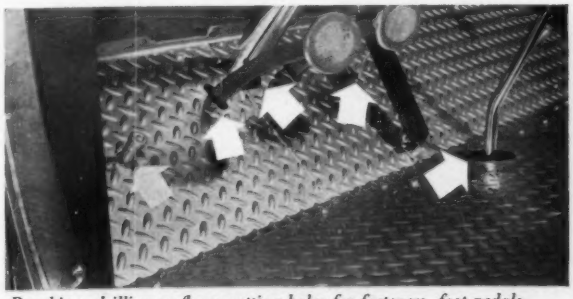
tough fabricating job on fire engine proves 4-WAY'S® versatility

Fabrication to form even the varied and complex shapes used on firefighting equipment is no problem with 4-WAY Safety Plate. No special tooling is necessary. Ordinary cutting, drilling, forming and similar standard shop equipment is all that's needed. Good reason why this leading chassis and body manufacturer has specified Inland 4-WAY for more than 15 years! 4-WAY is used in an uncommonly wide variety of ordinary and extra-ordinary applications. For complete information and specifications, write Dick Prendergast, Room 1262 at the address below.

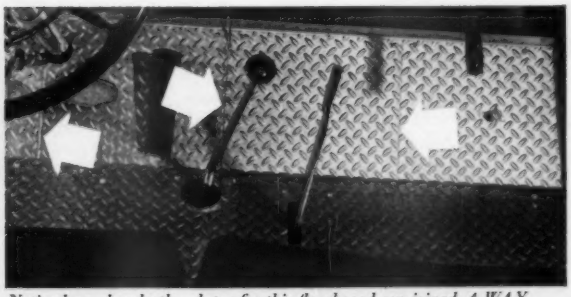
Uniformity of 4-WAY's cross-sectional thickness eliminates the possibility of deflection while bending, even at sharpest angles. Standard equipment can be used.



Whether the application calls for welding, bolting, or screw fastening, all are easily accomplished on 4-WAY with conventional methods.



Punching, drilling or flame cutting holes for fasteners, foot pedals, etc. is no problem with 4-WAY.



Notice how cleanly the plates for this floorboard are joined. 4-WAY can be sheared to extremely close tolerances eliminating all guesswork and make-overs.

Inland 4-WAY® Safety Plate

Carried in stock by all leading steel distributors

INLAND STEEL COMPANY

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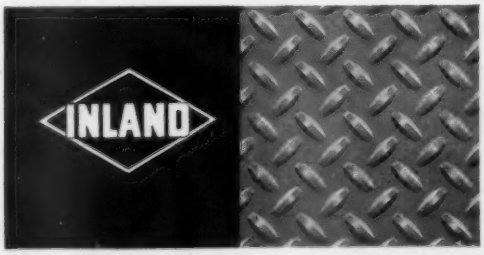
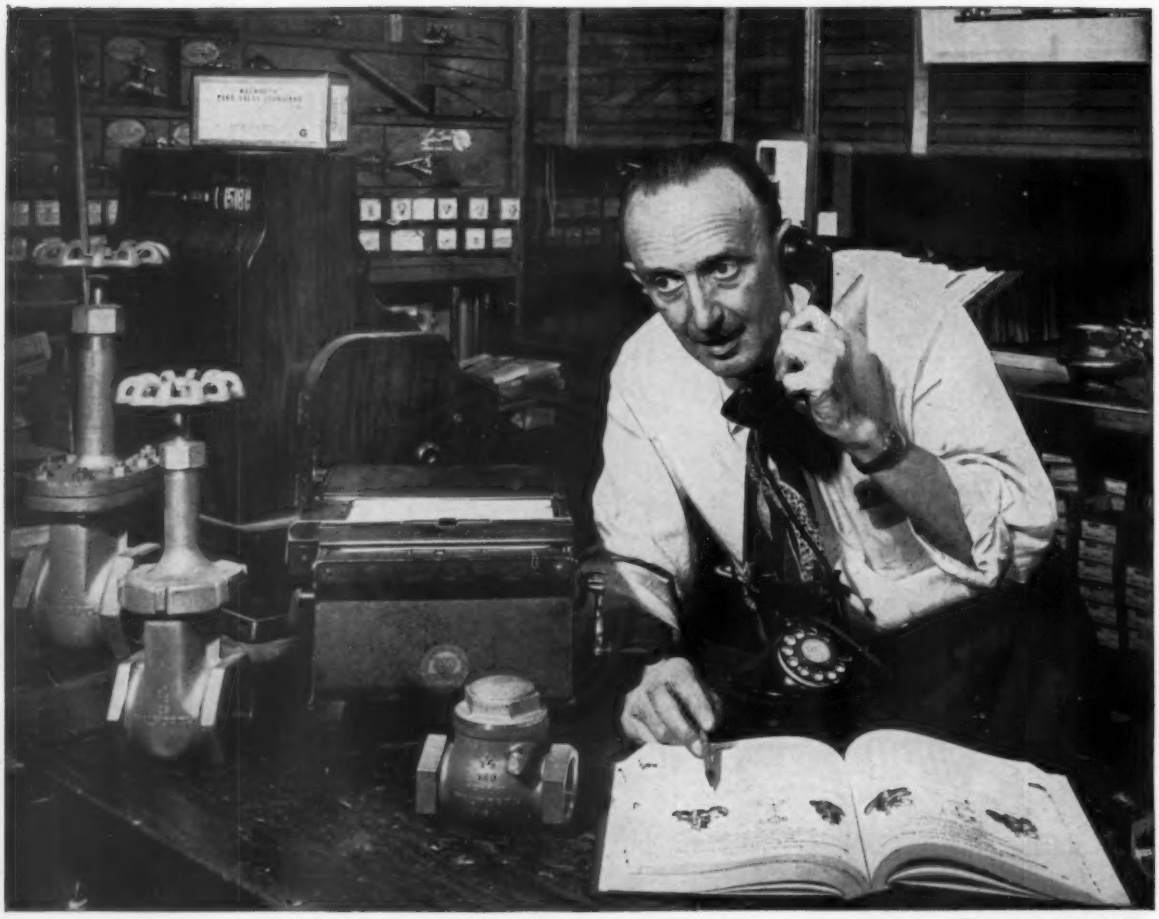
Sales Offices: Chicago • Milwaukee • St. Paul • Davenport
St. Louis • Kansas City • Indianapolis • Detroit • New York



For more facts circle 633 on Reply Card



*Fictitious name used to typify over 400 Walworth Distributors

Here's why it pays to do business with distributors like Mr. Hansen*

Andy Hansen is typical of Walworth Distributors throughout the nation. He has been a distributor of Walworth Valves and Fittings for years. Like Andy, the Walworth Distributor in your area provides these services and savings:

He reduces your inventory costs. He's aware of the valve and fitting needs peculiar to his area. He stocks the products that will best serve your needs. Deliveries are always prompt and economical – emergency orders can generally be delivered within hours.

He offers you application and engineering assistance. His technical experience can be invaluable in solving your particular problems. He has 50,000 Walworth products at his disposal. You can be sure that the items he recommends are exactly right for the job.

He is a double guarantee. His business depends upon providing you with the very finest products and unsurpassed service. Every valve and fitting is backed by his own reputation and that of Walworth – a complete line manufacturer.

There's a Walworth Distributor near you ready to help. Call on him today.

WALWORTH

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

Walworth Company of Canada, Ltd., Toronto

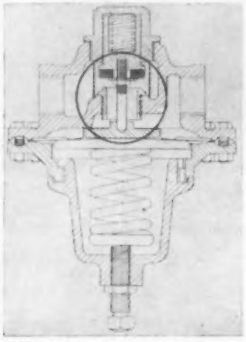
For more facts circle 634 on Reply Card

(Begins on page 188)

(canvas to canvas) is given as 104 psi after 10 min and 112 psi after 24 hr. Manufacturer says Ray-Bond R-87001 is resistant to water and diluted alkalis. It is not recommended for use where heat or solvents are present. It can be applied by extrusion or brush. To develop highest strength it should be allowed to set for 24 hr, but joined parts may be used immediately after pressing together, it is noted. Raybestos-Manhattan, Inc.

64—REGULATING VALVE offers higher capacity

Described as an improved pressure regulator, this valve incorporates a larger through passage which gives a greater capacity and also a less turbulent flow patttern through the valve. Construction is simpler, says manufacturer, and valve

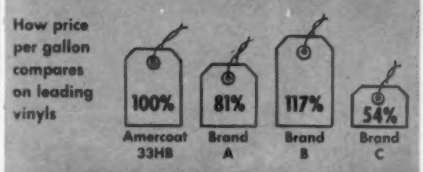


discs are interchangeable. Thus, you can switch quickly from water service, for example, to steam, gas or air—by simply removing one disc and substituting a disc for the service desired. There is also an added safety factor, it is noted, because the spring adjustment is made from below. Reduced pressure range is from 1 to 100 psi, depending on size of valve, with initial pressures as high as 400 psi. The unit has a built-in strainer. The valve can be had in bronze, semi-steel, or steel body with alloy trim, if desired. Six standard sizes range from ⅜ to 2 in. Davis Regulator Co.

65—PALLETS offer quality, economy features

Through a lumber manufacturing process which produces uniformly finished deckboards and stringers in fewer operations and with less waste, this company is able to sell Fine-Sawn Pallets at prices reportedly 25 per cent lower than customary for quality pallets. In addition, the machinery used to produce these pallets, gives them a "flocked," non-slip surface designed to help prevent cartons and bags from slipping off—yet the surface is smooth to the touch. Wax-tipped deckboard and stringer ends are provided in the Fine-Sawn Pallets. Manufacturer says this treatment increases pallet life and utility by sealing the ends of the

YOU CAN'T KNOW
what the real
price tag is...



UNLESS YOU
compare mil sq. ft.
per gallon and...

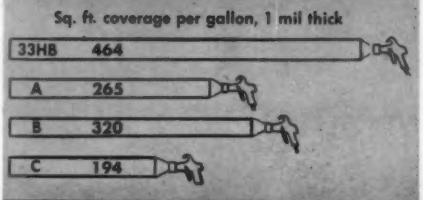
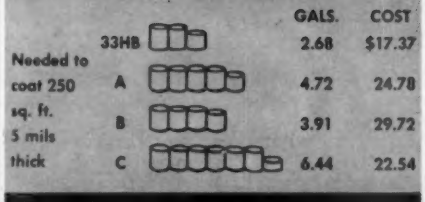
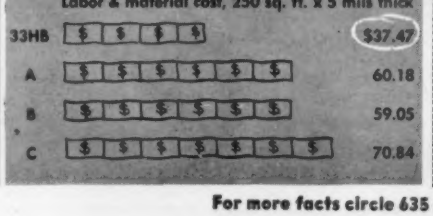


FIGURE THE
material cost of each
coating, then get the...



REAL COST
by adding labor for the
number of coats needed.



Announcing...
A True High Build Vinyl Coating

Amercoat 33HB now gives you even *more* "mils per gallon" —and at the lowest cost of any leading vinyl!

At last, the two major limitations of vinyl protective coatings—critical adhesion and low film thickness—have been largely overcome. Amercoat 86 Primer stopped adhesion troubles, eliminated underfilm corrosion and undercutting, and simplified surface preparation. *Now Amercoat 33HB Topcoat builds thick films in fewer coats at surprising savings.*

Amercoat 33HB is a "high-build" version of Amercoat 33, the standard of the protective coatings industry for over ten years. 33HB gives you the same high resistance to corrosive chemicals, severe weathering and abrasion, *plus 33% greater thickness per coat!*

The solids content of 33HB tops all other non-mastic vinyl coatings, yet workable viscosity is retained. It applies smoothly and easily by hot or cold spray. No need to stock two types of materials.

New Lower Cost

In evaluating any coating, always look at the cost per square foot, and the number of coats required to build proper film thickness. 33HB is nearly 24% cheaper per mil square foot than traditionally low cost 33...and compared to other leading vinyls, (see chart) savings are even greater. For example, although the gallon price of Coating "C" is 46% lower than 33HB, because of its low solids content the actual *material* cost for 5 mils thickness is almost 30% higher than 33HB, and the applied cost, (labor and material) is almost 90% higher.

For the full story, send coupon for data on 33HB and detailed cost comparison of the four coatings on the chart.

Amercoat® CORPORATION
4809 Firestone Blvd. · South Gate, Calif.

AMERCOAT Corp. Dept. LF
4809 Firestone Blvd.
South Gate, Calif.
Please send me full information on Amercoat 33HB

Name_____
Title_____
Company_____
Address_____
City_____ Zone____ State_____

For more facts circle 635 on Reply Card

When is adequate wiring

...really adequate?

Heavier wiring is not the *complete* answer to adequate wiring. You must be able to *use* the wire to its full, safe current carrying capacity. That means you should not have to *derate* your circuits.

Derating simply subtracts from your usable electrical capacity. It's a means of allowing for changes in performance of many circuit protectors when they're warm. But, the rating of HEINEMANN CIRCUIT BREAKERS never changes.

Hot or cold, Summer or Winter, you enjoy the full safe use of your wiring system. Derating—under any conditions—is eliminated.

When you specify HEINEMANN CIRCUIT BREAKERS, you make sure that "adequate" wiring will always be *really* adequate . . . and safe.

Send for your copy of Manual 101, "What you should know about circuit breakers."

HEINEMANN
ELECTRIC COMPANY *Circuit breakers*
128 Plum Street, Trenton 2, N. J.

For more facts circle 636 on Reply Card

NEW PRODUCTS

(Begins on page 188)

deckboards and stringers to control moisture content and stabilize the wood. Sterling Lumber & Supply Co.

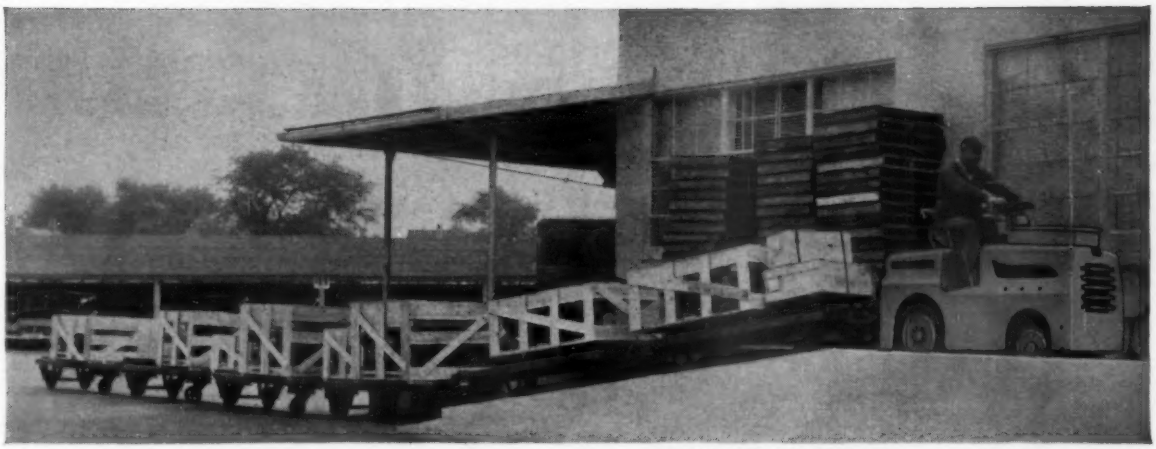
66—RING-CHAIN keeps socket set screws together

Hexkees, a ring-chain combination for keeping a complete set of socket set screws together, permits instant use of either end of any key without removal.

Each key is fastened to its chain by a sliding ring which allows key to be rotated without winding the chain up around it—the individual key never being removed except to substitute a duplicate size or to replace a broken key. This can be done by pulling off retainer sleeves and assembling them, together with sliding ring, on the replacement key. Standard assortment includes nine keys, standard size 0.050 in. to ¼ in. inclusive, for about $1.50. Hard Inc.

67—PYROMETERS designed for reading accuracy

According to manufacturer, these indicating pyrometers may be read more accurately from all angles because they have been redesigned with mirror scales to cut down parallax effect. They are medium resistance pyrometers (4 ohms per millivolt) available in 21 standard ranges. Maximum sensitivity for a pyrometer connected to one thermocouple is 300 F for full scale deflection, company states, and standard ranges begin with -400 to 100 F, go up to 0 to 3000 F. Full scale



DYNAMOTIVE Tractor above "walks away" with 19,225 lb. load up 12% grade at Robbins & Myers plant.

NOW...A GAS TRUCK THAT DOES MORE WORK ON 25% TO 30% LESS GAS...

Automatic DYNAMOTIVE

The secret of Automatic DYNAMOTIVE'S (GLF Series) proved superior performance lies in its utter simplicity...an engine-driven variable voltage generator supplies electrical power to the drive motor direct coupled to the drive axle. This proved power train *without gears* eliminates slippage and power loss through heat build up. Additional gas mileage is achieved by the inherent overdrive and torque multiplying features of the electric power train.

Among many other advantages are the following:

Positive Inching Control...precise spotting gives faster, safer handling of loads.

Job Adjustable...directional control can be adjusted... on the job...for instant power or cushion-smooth takeoff.

Tilt and Lift Controls...optional for either foot or fingertip operation.

Full Width Posture Seat...accessible from either side ...reduces driver fatigue.

Visibility...high visibility of fork position throughout lifting range.

Safety...Dynamotives are listed by Underwriters' Laboratories Inc., and Factory Mutual Laboratories.

G.L.F. Capacities: 4,000 to 10,000 lbs. with solid tires... 4,000 and 6,000 lbs. with pneumatics. Tractors available in 2,500 and 3,500 lbs. draw bar pull.

But see for yourself. *Ask for demonstration* and/or complete specifications with case histories of installations similar to your own. No obligation...write today.

Part of a **DYNAMOTIVE** "fleet" used for warehousing, loading, etc. Calumet Industrial District Co.

This **DYNAMOTIVE** unit paid for itself in one year says Lock Joint Pipe Company official.

Factory service available in over 100 cities.

Automatic

Dept. H-7
105 West 87th Street
Chicago 20, Illinois

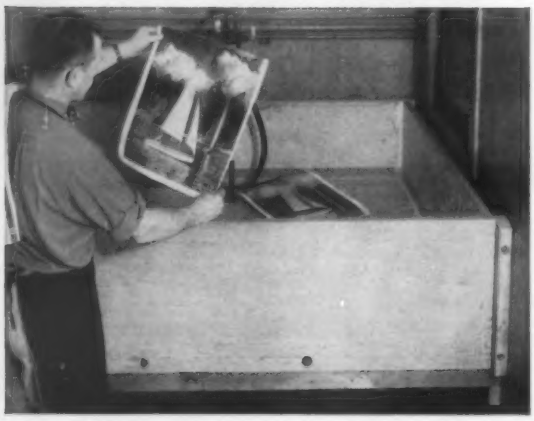
For more facts circle 637 on Reply Card

SMOOTH

Smooth and glossy surface of high-density overlaid fir plywood makes it an ideal choice for work-table tops. Overlay is a fused resin-fiber, impervious to water and most chemicals—dense and hard, free of grain. High-density overlay can be painted, but is most often used with no finish of any kind.

DURABLE

Fir plywood, constantly subjected to 200° F. steam heat, proved highly successful in this tobacco stem drier. Constructed of ¾" Exterior-type (EXT-DFPA) plywood, the unit was given no finish on the inside and only a shellac finish on the outside. Exterior plywood glue-line withstands water, weather, extremes of temperature.



VERSATILE

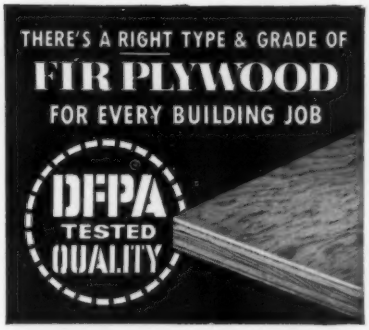
Developing tanks in a photo-offset plant demonstrate the versatility of Exterior-type fir plywood. Virtually every kind of maintenance or materials handling problem can be solved with plywood. It is easy to handle, easy to work with ordinary hand or power tools . . . real wood, engineered for strength and durability.

DFPA® TESTED QUALITY

FIR PLYWOOD

means quality construction

FOR MORE INFORMATION about uses shown above, design and/or specification data, mail coupon ⟶



1. SPECIFY BY DFPA QUALITY TRADEMARKS

DFPA grade-trademarks appear only on plywood manufactured, inspected and scientifically tested under the DFPA quality control program. DFPA, Douglas Fir Plywood Association, is a non-profit industry organization devoted to product research, promotion and quality maintenance.

2. CHOOSE THE RIGHT GRADE FOR EACH JOB

Fir plywood comes in two types: 1. *Exterior* (waterproof glue for permanent exposure to water or weather); 2. *Interior* (moisture-resistant glue) for indoor uses, crating, sheathing, maintenance. Within each type are several grades – i.e., panels with one good side, two good sides. Most popular grades are shown below.

EXT-DFPA — Exterior plywood for permanent outdoor uses

PlyPanel® for paneling, most indoor uses

PlyScord® is unsanded panel for sheathing, crating, bins, etc.

PlyForm® concrete form grades come in Exterior and Interior types.

SPECIALTY PANELS include 1. *Overlaid Exterior plywood* (hard, smooth, abrasion-resistant fused resin-fiber surfaces) for siding, signs, tanks, concrete forms; 2. *Textured panels* with smart grooved, brushed or striated surfaces for fixtures, siding, special decorative effects.

DOUGLAS FIR PLYWOOD ASSOCIATION
Tacoma 2, Wash. (Good USA Only) Dept. 179
☐ Please send basic fir plywood specification data.
☐ Also send information about use of fir plywood for.....
Name.....
Firm.....
Address.....
City..... Zone.... State.....

For more facts circle 638 on Reply Card

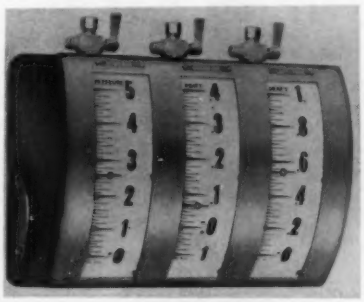
NEW PRODUCTS

(Begins on page 188)

accuracy of 2 per cent is reported standard, although 1 per cent is offered at extra cost. Pyrometers may be thermistor-compensated to maintain accuracy in spite to ambient changes. They are furnished with compensation for changes in cold junction. Styles available include panel mounting, portable and bench models. Meters are 3¾ and 4½ in. wide. Assembly Products, Inc.

68—MULTI-POWER GAGES are vertical scale type

Where easy readability must go hand-in-hand with space-saving installations, these dry diaphragm instruments are reported to give an instant, accurate and continuous picture of the flow of air through the boiler. Available in two- or three-pointer



models, which may be combined for multiple installations, the units are used for measuring over-fire draft, outlet draft, first and last passes and windbox pressures. Equipped with big scales of translucent Lucite for interior illumination, and large pointers, the gages are designed to be read from any point in the boiler room with no parallax. Scales are marked with designation desired by user by means of engraved identification name plates. Because of their vertical design, two of these instruments offer space saving advantages. They are made in projected or semi-flush mounting styles. Cleveland Fuel Equipment Co.

69—SIGHT GLASS also serves as moisture indicator

The Super Dry-Eye is a refrigeration servicing instrument designed to enable detection of basic refrigeration system trouble in its earliest stages. It is a T-shaped brass fitting, similar in size, appearance and price to company's regular Dry-Eye, introduced previously. However, where the latter offered only one moisture indicating element, the Super Dry-Eye has two: one for Freon-12 and another for Freon-22, plus a built-in sight glass. The indicating element for Freon-12 shows blue when the refrigerant is dry and in safe operating condition (when moisture content is below 10 ppm). When this element turns pink, the refrigerant is dangerously wet (above 30 ppm). For Freon-12 the element is green when dry (below 20 ppm) and pink when wet (above 25 ppm). The circular fused glass window through which moisture indicating elements are visible also serves as a sight glass. Bubbles in the flowing refrigerant indicate a low refrigerant charge or a restriction in the line. Ansul Chemical Co.

Use the Reader Service Cards provided on pages 269-270 to ask for more information on these products. Circle item numbers of products in which you are interested.

70—DUST COLLECTOR is air recirculating type

No. 20C30 is described as an air recirculating type of dust collector requiring no outside exhaust outlet. It has an air capacity of 2405 cfm and a dust storage capacity of 6 cu ft. Dust particles are separated from the air within the unit by a cyclone separator, and the dust is precipitated into a bin in the base. Air is exhausted into a 3-by-7½ ft bag, designed to filter out finest dust particles and release the dust free air into the work area. The bag is cleaned by shaking. This collector is intended for use in pattern shops, and smaller woodworking industries. It can also be used in buffing and grinding operations, says manufacturer, and it has many applications in the chemical industry. Aget Mfg. Co.

71—SAFETY HAT, made of plastic, is low cost

Constructed with a plastic shell, the GenTex Safety Hat is reported to surpass standards of protection and incor-

porate a number of other advantages at a price of $4.25 in lots of 100. It is available in a brimmed model (No. 105, shown) and a peaked cap (No. 205). Besides exceeding safety requirements for resistance to pressure, impact, combustion and voltage, the plastic shell is claimed to withstand violent extremes in temperature, and to be especially useful in zero and sub-zero climates. The hat incorporates company's suspension system for

Unique turbulent area assures positive dust collection at constant efficiency . . . to the micron range

Here is the "heart" of the Hydro-Filter principle of dust separation. This violently turbulent area of water, bubbles and mist is produced by the countercurrent action of air against water. Constant long contact between the air being cleaned and the water which is doing the cleaning produces a scrubbing action which is positive, thorough and unaffected by variation in volume and velocity of flow. Dust is entrained by any, or all, of three means: (1) Entrapment within falling water droplets; (2) Impingement on bubble surfaces; (3) Impingement on wetted surface of glass spheres.

As the photo indicates, the entire collection area is continually flushed. There are no dead areas to corrode or erode. No moving parts to "load up" and reduce efficiency. Maintenance is a matter of *minutes a month*. Collection of dust to micron size is continuous and sludge removal automatic with the National Hydro-Filter.

Write for Bulletin 55 . . .

See why and how separating efficiencies of up to 98.9% on foundry shakeout dust are possible practical—and continuous with Hydro-Filter!

NATIONAL

Dust Collector Corp.

604 Machinery Hall Bldg., Chicago 6, Illinois

Subsidiary of National Engineering Company, Manufacturer of Simpson Mix-Mullers.

For more facts circle 639 on Reply Card

NEW PRODUCTS

(Begins on page 188)

comfort and protection, which is readily washable in home or commercial laundry machines. General Textile Mills.

72—CIRCUIT BREAKERS in ratings to 400 amp

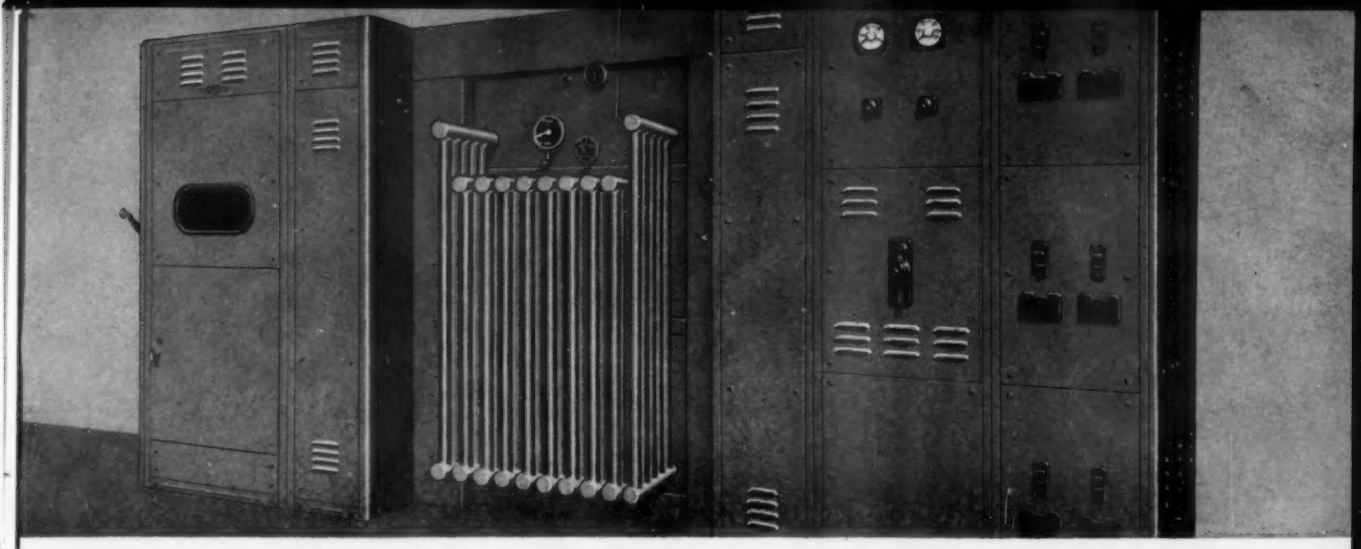
Tri-Pac Circuit Breakers contain a modified AB breaker and a current limiting fuse with three tripping elements; time-delay thermal, instantaneous, magnetic, and current-limiting fusible. The new breaker is claimed to eliminate any pos-

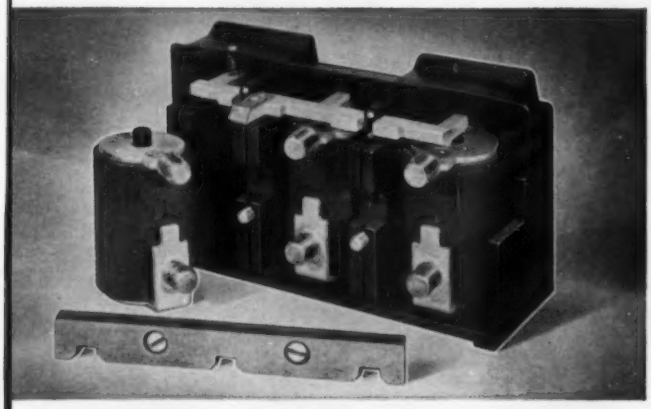
sibility of single-phasing on faults, and can be quickly reset after breaking on overload or usual fault current. Tripping cause, whether overload, usual fault or extreme fault, is indicated on resetting of breaker. Company notes that fuse testing is eliminated by the plungers in the special fuses that tell which phase or phases are in trouble. The breakers now come in three frames in NEMA standard ratings of 100, 225 and 400 amp, two or three poles. Higher ratings are planned. Interrupting capacity at 250 v d-c and 600 v a-c is 100,000-rms amp. Westinghouse Electric Corp.

73—WATER HEATER is multi-coil gas unit

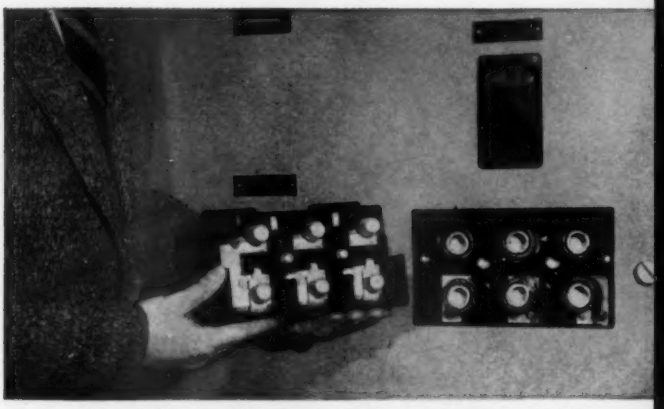
For industrial and other water heating applications where draws of hot water are heavy within a limited time period, the Model 300A is introduced. This multi-coil automatic, circulating tank, gas water heater is designed for use with natural, mixed, manufactured and LP gases, Among suggested applications is that of meeting high or intermittent-peak demands. To recover tank temperature in intervals between draws, Model 300A may be connected to a storage tank, singly or in multiples, with the tank horizontal or vertical and the water circulation either gravity or pump-forced. Another use is for sprinkler system towers. For semi-continuous demands where draws are of long duration, the heater may be used with a relatively small storage tank —one or more heaters being connected to provide a recovery equal to the draw of hot water. (The function of the storage tank in this case is to equalize water temperature rather than provide volume

For more facts circle 640 on Reply Card →





Four frame sizes of the 100,000 RMS ampere IC rated "Cordon" current-limiting breakers are now available—100, 225, 400 and 600 amps; 600 volts AC; 250 volts DC.



Mounted in molded cases, the Amp-traps are accessible from the front of the substation for speedy replacement. Consult a BullDog field engineer for complete details.

Now... Unit substations with new "Cordon" current-limiting breakers

Provide greater protection against high short circuits at less initial cost

Now, get the additional protection of this newly developed I-T-E Breaker in BullDog unit substations! "Cordon" current-limiting breakers protect circuits where fault currents may reach 100,000 RMS amperes . . . limit short-circuit currents of high magnitude to a fraction of their possible value. In one compact device they combine the advantages of standard thermal magnetic breakers with current-limiting characteristics of Amp-traps*.

These "Cordon" breakers bring real savings, too, since they can be used where more costly air breakers were once required. Amp-traps are mounted in a molded housing on the load side of the breaker. When any Amp-trap opens, all poles of the breaker open, thereby preventing possible single phasing.

Let a BullDog field engineer give you all the facts . . . show you the many safety and economy features of unit substations and complete BullDog electrical distribution systems.

© BEPCO

IF IT'S NEW... IF IT'S DIFFERENT... IF IT'S BETTER... IT'S

BULLDOG

ELECTRIC PRODUCTS COMPANY

A DIVISION OF I-T-E CIRCUIT BREAKER COMPANY

BullDog Electric Products Company, Detroit 32, Michigan. • A Division of I-T-E Circuit Breaker Company. • *Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Company (Canada), Ltd., 80 Clayson Rd., Toronto 15, Ontario.

*Trade-mark registered by Chase-Shawmut Company

STOP WISHING . . . START GROWING

. . . we think the right job for you is here at Western Electric

What do we mean by "the right job?" Well, mostly we mean there's a bonafide chance for you to *grow* at Western Electric.

It figures . . . in both the work we do and the status of the engineer in our company. Fully 55% of the college graduates in Western Electric's upper level of management have engineering degrees.

Keep in mind, too, that we follow a policy of promotion from within. And present indications are that at least *8,000* of our people will be promoted to management jobs in the next ten years.

Now, about our work. The wide range of functions at Western Electric includes production, merchandising, purchasing, installation and other aspects of the overall job. To make their technical work effective, many engineers participate in these broad managerial functions.

To keep pace with the ever increasing demand for more and better telephone service there's a constant need here for new products, new processes, new ideas. And for young engineers and scientists to help with the job.

Perhaps you'd work in the exciting world of transistors . . . automation . . . electronic switching . . . printed circuitry or one of our many other fields with a future. Or you might help with one of the defense contracts the government has asked us to take over – major projects like SAGE, the continental air defense system, the DEW Line arctic radar network, the Nike guided missile system–to which Western Electric engineering has made indispensable contributions.

Whatever your assignment with us – whatever your field–you'd be encouraged to move to positions of increasing responsibilities and rewards . . . to *grow*. A full-time graduate engineering education program is given new engineers during working hours to aid them to more easily assume a full engineering role in the company. Also, a tuition refund plan is provided for out-of-hours study at nearby colleges at company expense.

Certainly you'll want to learn of the specific opportunities available to you. To apply, send resume of your education and experience to Engineering Personnel, Room 1064 Western Electric Co., 195 Broadway, New York 7, N. Y. In confidence, if you wish.

Western Electric

MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM

Manufacturing plants in Chicago, Ill.; Kearny, N. J.; Baltimore, Md.; Indianapolis, Ind.; Allentown and Laureldale, Pa.; Burlington, Greensboro and Winston-Salem, N. C.; Buffalo, N. Y.; North Andover, Mass.; Lincoln and Omaha, Neb.; St. Paul and Duluth, Minn. Distributing Centers in 30 cities and Installation headquarters in 16 cities. Also, Teletype Corporation, Chicago 14, Illinois.

For more facts circle 641 on Reply Card

NEW PRODUCTS

(Begins on page 188)

storage.) For industrial processing, these heaters may be used to heat fluids directly by circulation; or by submerged coil.

With four horizontal coils, each independently removable, Mode 300A occupies a floor space of 26 by 38 in., and is 50½ in. high. Btu input is 285,000 and recovery rate is 239.4 gph at 100 F temperature rise. Ruud Mfg. Co.

74—CLOCK HANGER OUTLET has oversize recess

This all-bakelite, one-piece clock hanger outlet, available in both brown and ivory, is modern in design and construction and features an oversize recess 2½ by 1½ by 1 in. to take a large size cap and provide storage of the coiled cord. The non-corroding metal hook is locked into position and cannot twist, company says. The receptacle unit provides easy side wiring and has heavy duty terminal and binding screws. Catalog Sheet 2-56-10 gives more details. Royal Electric Corp.

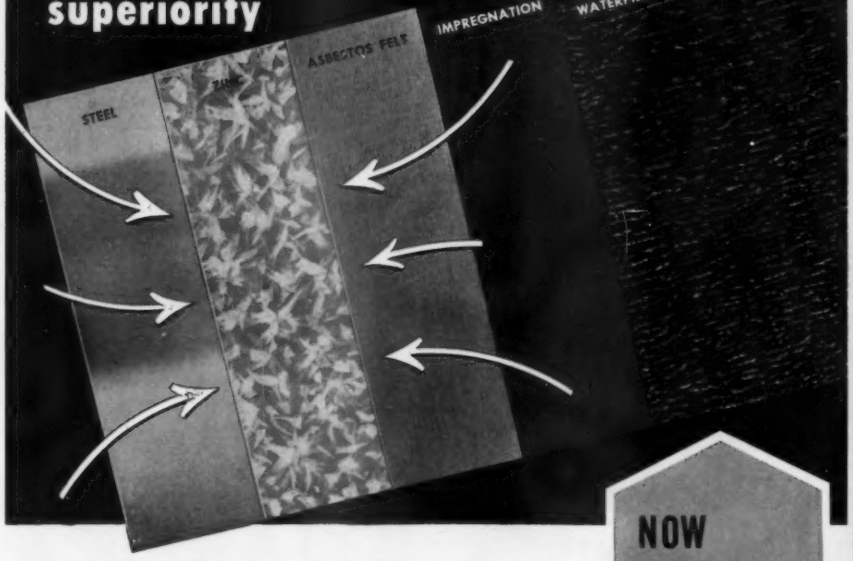
75—FLANGED CLAMP for stopping pipe joint leaks

This clamp is intended for stopping water pipe leaks at the joints—and for strengthening joints where a leak has weakened them. According to manufacturer, it seals joint leaks and clamps tightly on both threaded pipe end and fitting, reinforcing the joint. It differs from many clamps in having an expanded end which laps over the band of fitting. Also, inside the clamp is a cut-back to make room for a soft Neoprene rubber ring which is squeezed into the threads at the source of the leak, when the clamp is tightened into place with its four bolts. When in conjunction, each half of the clamp has on the inside a long tongue to fit into a channel to make a compact pipe-sleeve (even if pipe is out of alignment).

It is pointed out that with this clamp, you can do a double repair job in a single operation—stopping the leak and restoring original strength lost due to red rust, vibration or daily strain on the joint. Although designed for water-pipe

For more facts circle 642 on Reply Card →

How molten metal helps give Galbestos its superiority



Robertson Color Galbestos has the greatest resistance to weather and corrosion of any protected steel roofing or siding obtainable anywhere. This position of broad superiority is made possible by a unique manufacturing process exclusive with H. H. Robertson Company.

First, the steel sheet is pickled . . . then given a coating of molten zinc. Asbestos felt is then pressed on so that as the molten metal hardens in cooling it grips the felt fibers in absolute bond. The asbestos is then impregnated with a special asphaltic compound and, finally, given a tough weatherproof coating. Galbestos can be furnished flat or in the 3 well-known corrugations: Standard, Mansard, and V-Beam. The resultant material is so durable, it may be sheared, bent, rolled, crimped and riveted in the field as easily as ordinary unprotected steel. It will withstand the greatest possible extremes in weather temperatures without deterioration, and will actually retard fire better than naked steel. For an industrial roofing or siding that requires no maintenance under the most severe corrosive conditions, specify Color Galbestos.

Long Service Life. Color Galbestos will give longer maintenance-free service under the most severe weather and man-made corrosive conditions. Even salt air cannot penetrate its tough coatings to destroy the steel core.

Not Fragile. Color Galbestos' strong steel core sheet guarantees against breakage—during shipment or during erection.

Resists Climatic Extremes. Color Galbestos is not subject to damage either by tropic or frigid temperatures. Its coatings will not run under broiling sun or crack or spall in sub-zero weather.

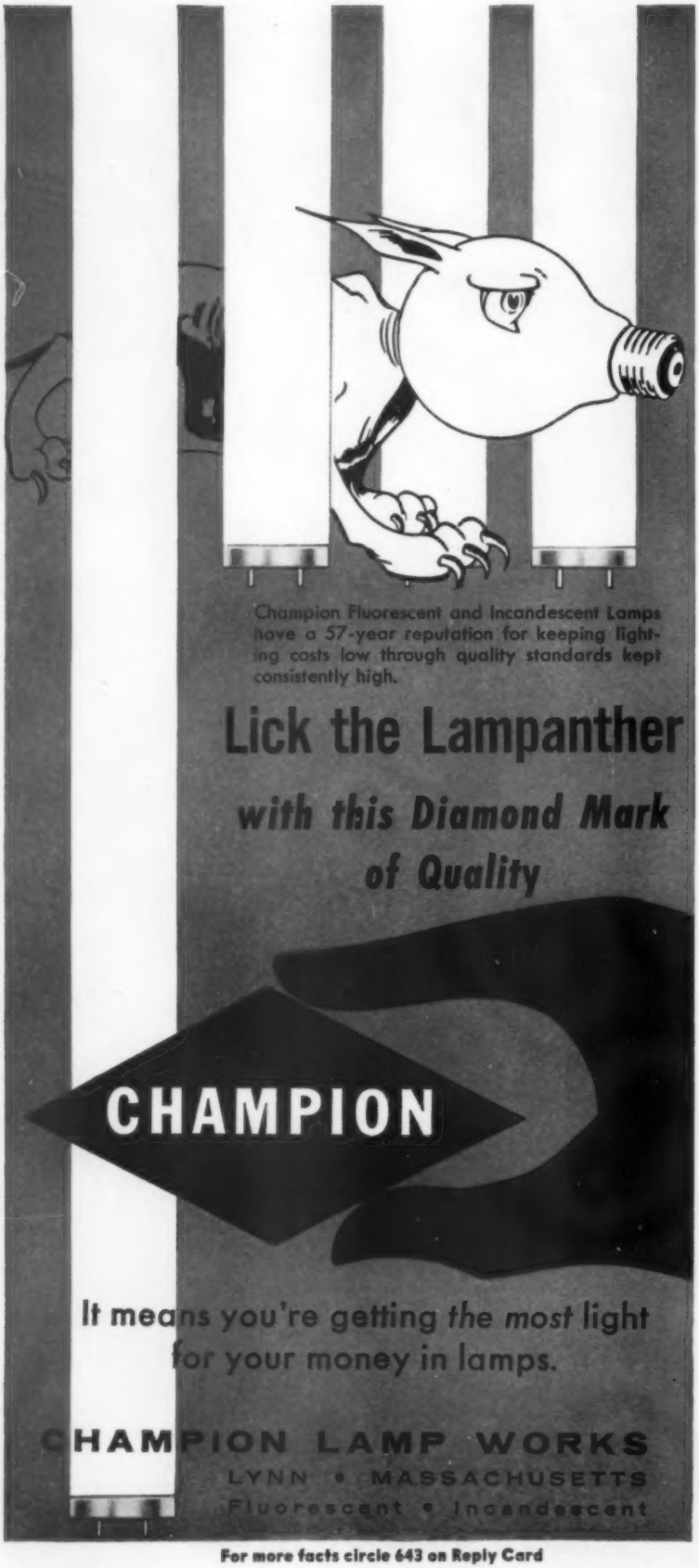
Goes Up Fast. The exclusive Robertson Top-Speed method of attaching Color Galbestos to structural steel speeds up erection for quicker occupancy.

Resists Flame. Leading testing laboratories have made exhaustive tests on the fire resistance of Galbestos and have published the results. Copies of these reports are available for study.

NOW AVAILABLE IN SIX USEFUL COLORS FOR ROOFS AND SIDEWALLS

Robertson Color Galbestos

a product of H. H. Robertson Company
2419 Farmers Bank Building • Pittsburgh 22, Pa.
In Canada: Robertson-Irwin Ltd., Hamilton, Ontario
In England: Robertson Thain Ltd., Ellesmere Port, Cheshire


Champion Fluorescent and Incandescent Lamps have a 57-year reputation for keeping lighting costs low through quality standards kept consistently high.
Lick the Lampanther
with this Diamond Mark of Quality
CHAMPION
It means you're getting the most light for your money in lamps.
CHAMPION LAMP WORKS
LYNN • MASSACHUSETTS
Fluorescent • Incandescent
For more facts circle 643 on Reply Card

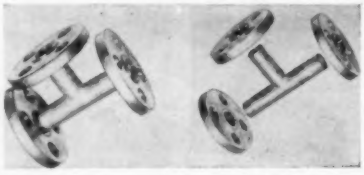
NEW PRODUCTS

(Begins on page 188)

leaks, this clamp is also reported suitable for repairing leaks in pipes carrying certain industrial liquids. The clamps are of cast aluminum and come in five sizes from ¾ to 2 in. to fit standard malleable fittings, wrought and steel pipe and 85 per cent copper pipe and screwed brass fittings. Burlis Products Co.

76—INSERT FLANGES repair stainless process piping

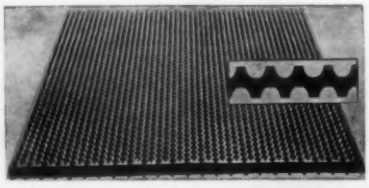
Speedline Insert Flanges are designed to enable tying in of new equipment and breaking into existing lines and headers without resorting to welding. Press fit



between insert and flange assures that pipe or fitting can be expanded into the ferrule permanently, it is stated, and further facilitates usage in that only one piece has to be handled. The "tangential" feature (extra straight section) on these flanges permits attachment by simple expanding operation. There is said to be ample clearance to permit flanging of one or all parts of fitting without fouling. Horace T. Potts Co.

77—RUBBER MAT makes standing easier, safer

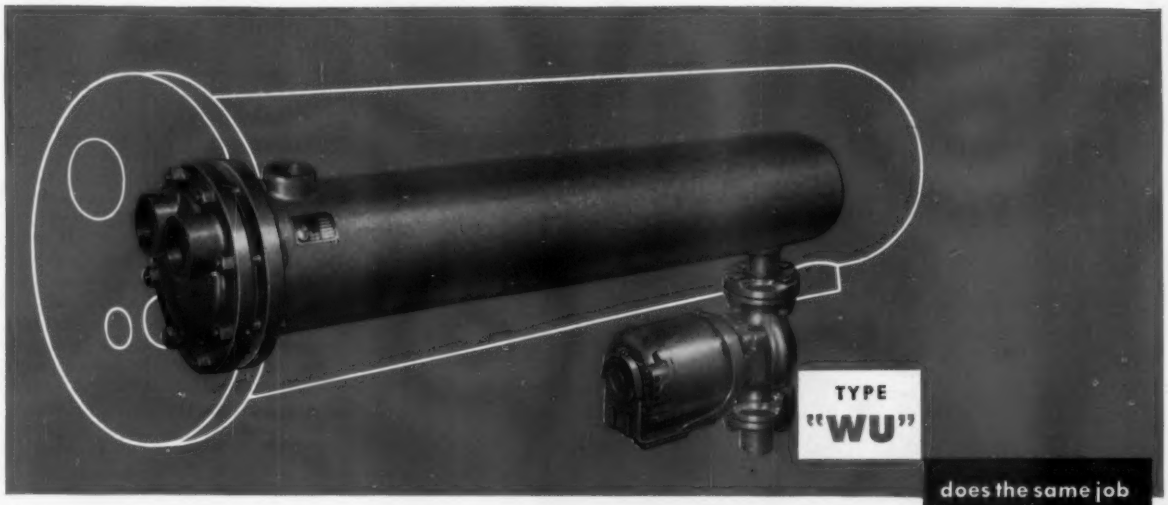
The Stand-Ease Mat is designed to prevent fatigue and provide a safe, non-skid area for those who stand at work. Of rubber, the mat's cushioning effects are



achieved by molded arch supports alternately placed on each side of the mat, which provide a ¾-in. thickness of resilient rubber to absorb pounding and vibration effects. Raised surfaces on both sides serve to keep the feet out of liquids and dirt that remain on the floor. The mat is 28 in. square, weighs 10 lb, and costs around $5.00. Keaton Rubber Co.

78—A-C SENSITIVE RELAY with transistor amplifier

This electronic component is designed to resist vibration, corrosion and shock. Standard features include a two pole, double throw plug-in relay protected by a clear polystyrene dust-proof cover; a



does the same job as a much larger gravity circulated heater

More hot water from a smaller heater

Pumped boiler water circulation steps up capacity ...permits close temperature control

The B&G Type "WU" Heat Exchanger is an extremely versatile, instantaneous water heating unit, with a wide range of applications. It is equipped with a B&G Booster which pumps boiler water through the properly baffled shell, thereby greatly increasing the capacity of the heater. Large volumes of hot water are produced by amazingly small units.

Controls service water temperature

A hot water control, installed in the hot service water line, starts the Booster whenever water temperature goes below the desired degree. Boiler water is pumped through the shell of the "WU" until service water is again at the correct temperature.

Slashes material and labor costs

Because of pumped circulation, the connecting pipes and fittings can be radically reduced in size. Material cost is trimmed to the bone and cutting and threading can be done on the job. No storage tank needed—another substantial saving.

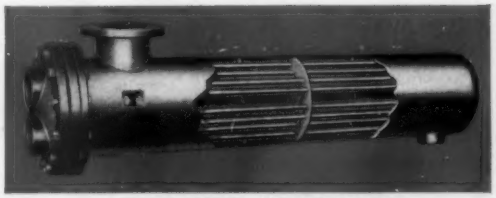
"WU" Heat Exchangers can be installed on hot water boilers or below the waterline of steam boilers.

B&G TYPE "SU" HEAT EXCHANGERS
for steam-to-water heat transfer

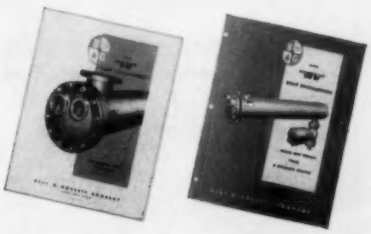
The "SU" Heat Exchanger is an instantaneous type—no space wasting, expensive storage tank required. It can be connected to any steam boiler or system and has numerous water heating applications in industrial and process plants.

"SU" Heat Exchangers are made in either 2 or 4 pass units, with ratings through a wide range of steam pressures. ASME construction is available for certain pressures without extra charge.

Where large volumes of hot water are continuously required, the "WU" is an economical producer



B&G TYPE "SU" HEAT EXCHANGER
...for heating water with steam

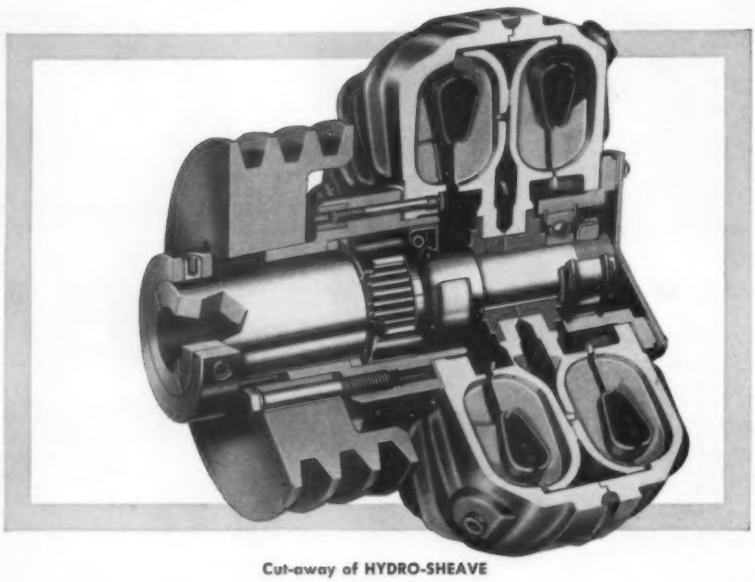


BELL & GOSSETT
COMPANY
Dept. EV-53, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

Send for catalogs on B&G "WU" and "SU" Heat Exchangers

For more facts circle 644 on Reply Card

Here's why machinery lasts longer *WHEN POWERED THROUGH FLUID*



Cut-away of HYDRO-SHEAVE

Wherever you find shock loads, torsional stresses or vibrations, you can bet both driving and driven equipment will show undue wear.

That is, *unless the power is transmitted through fluid!*

With Twin Disc Fluid Couplings and HYDRO-SHEAVE® Drives, there are no mechanical connections between driving and driven equipment . . . no metal-to-metal contact to transmit destructive shocks and vibrations. These, instead, are absorbed in the fluid—not in your machinery's expensive components.

But that's not all. Twin Disc Fluid Couplings and HYDRO-SHEAVE Drives offer such advantages as—

1. **Reduce motor starting current demands . . . provide smooth, fast acceleration . . . and often improve over-all power factor.**
2. **Protect against overloads, stalling and motor burn-outs.**
3. **Transmit full input torque at all output speeds.**
4. **Permit motor selection based on running rather than starting load.**
5. **Are engineered as a "package" . . . can be installed in minutes on any standard keyed shaft.**
6. **Because of fluid connection, *cannot* wedge or "freeze" internally.**

Twin Disc HYDRO-SHEAVE Drives—¾ to 50 horsepower; Fluid Couplings —¾ to 850 horsepower.

TWIN DISC
CLUTCHES · GEARS · HYDRAULIC DRIVES

TWIN DISC

Friction Clutches and Fluid Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Tulsa

For more facts circle 645 on Reply Card

NEW PRODUCTS

(Begins on page 188)

long life plug-in transistor amplifier and power pack module; 12-v d-c sensing circuit and low-sensing circuit current (less than 0.002 amp). Company says no warm-up time is required, and a convenient terminal board is provided for external connections. Its price is reported to be lower than many comparable products.

Low capacity contact making devices such as drop wires, feeler switches and gages, contact making instruments, sensitive thermostats and slow-make, slow-break contacts will operate without electrical damage when used with this relay, it is announced. Its high speed operation suggests use in stop motion or sorting circuits. The low voltage non-inductive circuit results in no visible arc, manufacturer notes, and thus eliminates fire hazards on applications where sensing contacts must be near flammable material. Long distance remote control, liquid level control and photo cell applications are also possible. Rated up to 10 amp, 110 v, 60 cycles, the relay comes in an open type panel or NEMA Type 1 general purpose enclosure. Bulletin 13535 gives data. Cutler-Hammer, Inc.

79—CLAMP-ON SHELF for drawing board or desk

The Keep-shelf is designed to save time by keeping drawing instruments, small tools or reference material within easy

reach, increasing normal working areas without taking up additional space. It locks level or may be tilted to desired angle. There are eight possible mounting positions. The unit measures 8 by 19 in. The 1½ in. capacity base brackets, equipped with thumb screws, permit installation and removal. Price is about $5. Downs Industrial Illustrators.

80—INDICATING LIGHT checks on lamp bulbs

This push-to-test indicating light unit is designed for quick testing for burned out lamp bulbs on control panels and push-button stations. Through use of a continuously energized testing circuit an immediate indication of a faulty bulb is given by pressing the unit's color cap, company announces — you don't have to remove the indicating light cap or the bulb. The device's basic unit is interchangeable with company's new illumi-

COMPACT . . . POWER-PACKED TRI 55 CLAD MOTORS

Plan now to use G-E TRI 55 CLAD motors in ratings to 125-hp

REG. U.S. PAT. OFF.

Increased production throughout U.S. industry has created a demand for more powerful machines with greater speeds and increased capacity. To meet this demand, General Electric will soon announce a wider range of Tri-Clad '55' motors in compact . . . power-packed dimensions.

ADVANCE INFORMATION—Experienced engineers and skilled craftsmen have utilized revolutionary new materials and the most modern production techniques to pack more power into these larger G-E motors built to new NEMA standards. The more rugged, higher horsepower motors will feature easy installation, reduced maintenance, and long-life performance.

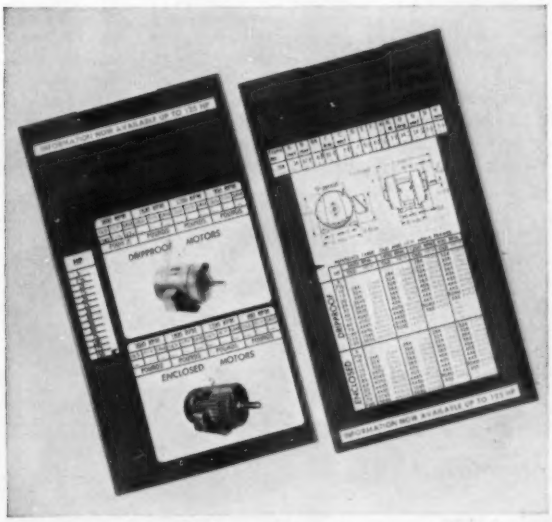
PLAN AHEAD—New Tri-Clad '55' motors can mean real savings in your plant modernization project and in new product design. For complete details on the wider range of motors, contact your nearest General Electric Apparatus Sales Office. For advance size information, send in the attached coupon for free slide rule. General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

FREE SLIDE RULE

ADVANCE INFORMATION TO HELP YOU PLAN AHEAD



FREE SLIDE RULE—Write for free slide rule which lets you determine at a glance the weight and space-saving benefits of new Tri-Clad '55' motors up to 125-hp. This handy slide rule provides advance information to solve your design problems . . . to benefit your over-all operation.

SECTION A891-2

GENERAL ELECTRIC COMPANY

SCHENECTADY 5, NEW YORK

I would like advance information on new dimensions of Tri-Clad '55' motors up to 125-hp. Please send me free slide rule.

NAME_____

TITLE_____

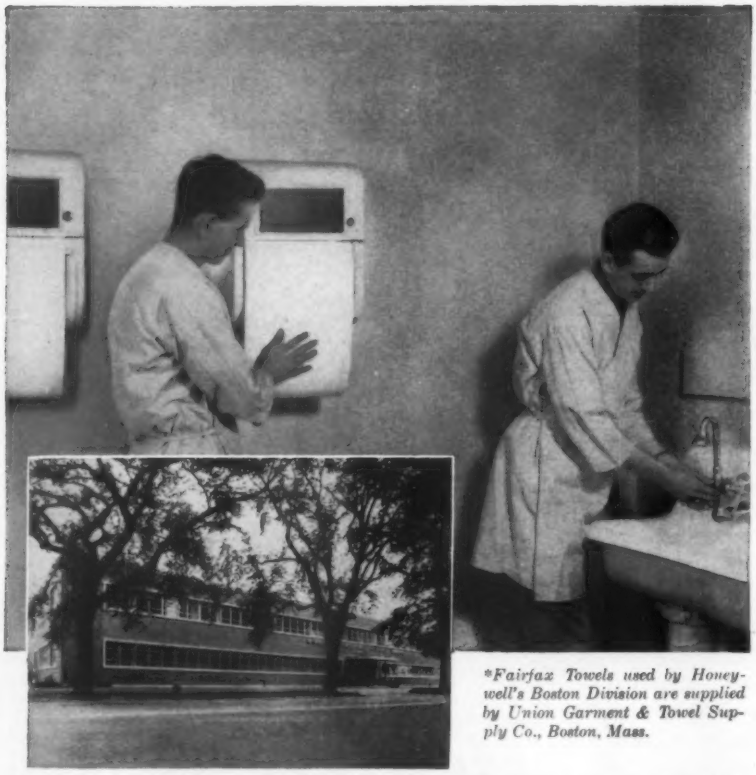
COMPANY_____

ADDRESS_____

CITY & STATE_____

For more facts circle 646 on Reply Card

Minneapolis-Honeywell Division finds COTTON* measures up

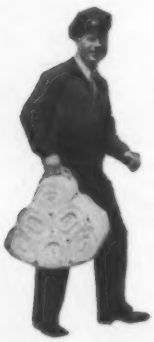


*Fairfax Towels used by Honeywell's Boston Division are supplied by Union Garment & Towel Supply Co., Boston, Mass.

Gyroscopes, amplifiers, null indicators, accelerometers—these are some of the measurement and control devices made by the Boston Division of Minneapolis-Honeywell Regulator Company. With this type of production, plus five buildings and 800 employees to care for, management is quite precise and engineering-minded about everything, including the towels in their washrooms.

"More manageable maintenance" is the phrase used by Honeywell to describe the success it has enjoyed with continuous cotton toweling in plant and office washrooms. Neater surroundings, with less fuss, less waste space—these have been the specific, tangible benefits.

Can you use these advantages, plus reduced maintenance cost, reduced fire hazard, improved employee relations? Give the towel job to cotton in *your* plant, office building or institution. For free booklet on how cotton towel service will help you, write Fairfax, Dept. P-6, 65 Worth Street, New York 13, N. Y.



Here's How Linen Supply Works...

You buy nothing! Your linen supply dealer furnishes everything at low service cost—cabinets, pickup and delivery, automatic supply of freshly laundered towels and uniforms. Quantities can be increased or decreased on short notice. Just look up LINEN SUPPLY or TOWEL SUPPLY in your classified telephone book.

Clean Cotton Towels . . .

Sure Sign of Good Management

Fairfax·Towels

WELLINGTON SEARS COMPANY, 65 WORTH STREET, NEW YORK 13, N. Y.

For more facts circle 647 on Reply Card

NEW PRODUCTS

(Begins on page 188)

nated oiltight push button by simple removal of jumper wiring.

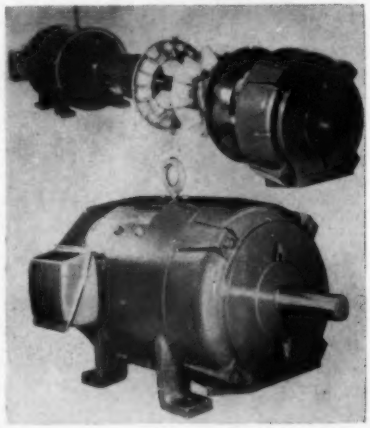
Easily fitted in the same hole and mounting space as existing oiltight units, the new device can be panel- or back-mounted. The cap is faceted for wide-angle visibility and comes in six colors. The device uses a 6-v bulb built to resist vibration and shock, and is reported to meet revised JIC standards for such lights. General Electric Co.

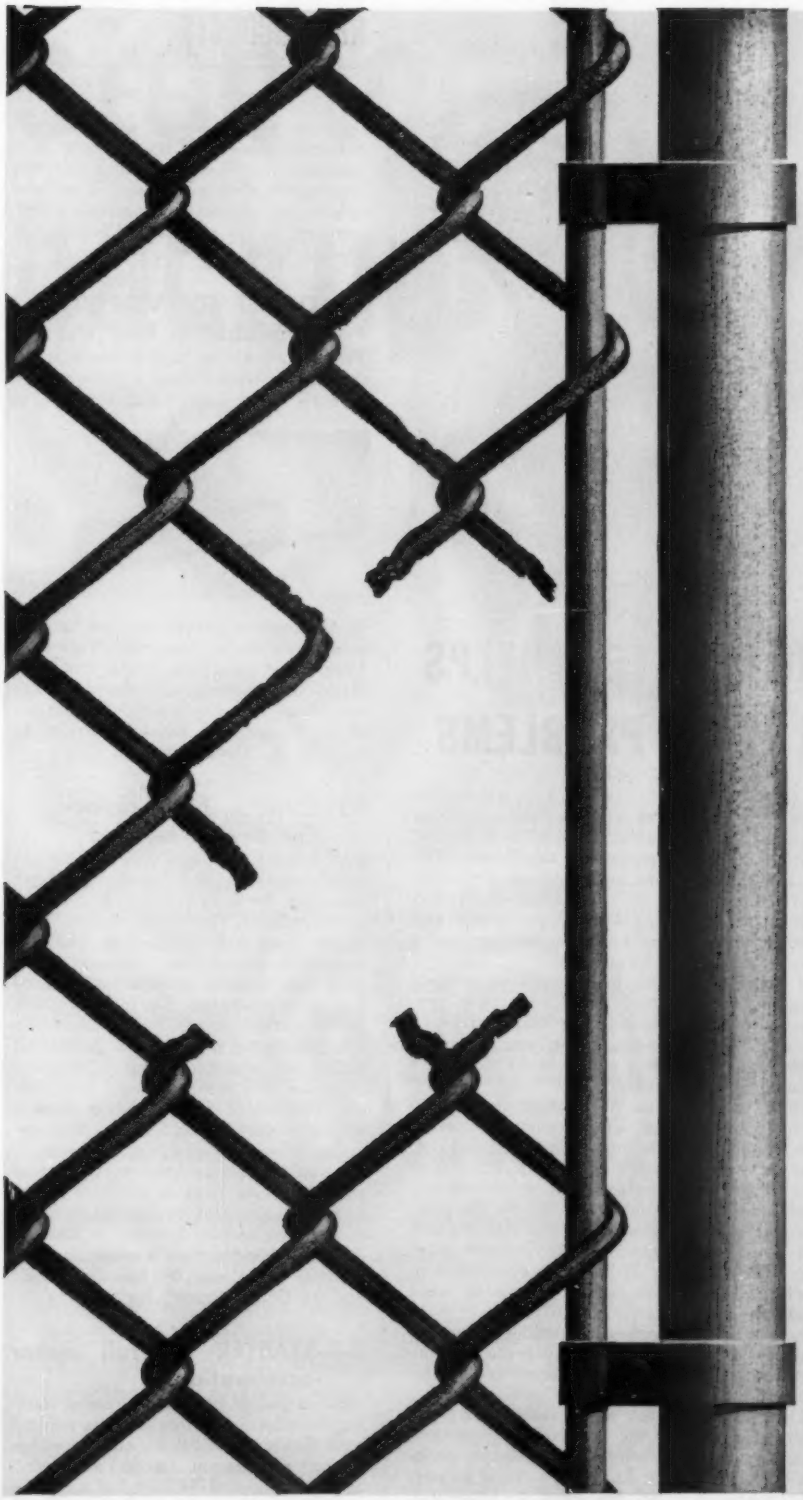
One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

81—D-C MOTORS, generators, with improved insulation

The Life-Line H series of d-c industrial motors and generators, is reported to achieve a new measure of performance and dependability from standard d-c machines. They are designed to be equally effective as basic prime movers or as elements of automatic production systems. The new units have dripproof enclosures as standard and bear NEMA Class B ratings; they span motor ratings from 1 to 150 hp and generator ratings from ¾ to 100 kw.

Among features announced as available for the first time in standard motors and generators are a high-temperature silicone insulation system in machines rated to operate within Class B temperatures; a controlled ventilation system that draws air from the drive end, distributes flow throughout the machine, and expels it at the commutator ends; and a housing construction which lets the dripproof machines serve many applications ordinarily requiring splashproof equipment. Further, as the result of a marked decrease in armature inertia and improved commutating ability, Life-Line H Motors are claimed capable of the fastest dynamic





CORROSION WAS HERE

You can cut the cost of maintaining fences, gratings, railings and all open metal work with Barrett Cold Coatings. These coatings, applied without heating by spray or brush, are noted for high chemical resistance . . . water repellence . . . long service life in corrosive atmospheres. Application is simple with fewer coats required to attain same buildup.

At a very nominal cost, Barrett Cold Coatings offer long-term protection of equipment in industrial and chemical plants and public works. Barrett will give you technical advice on their use for your particular plant. Call or write today.

Barrett®

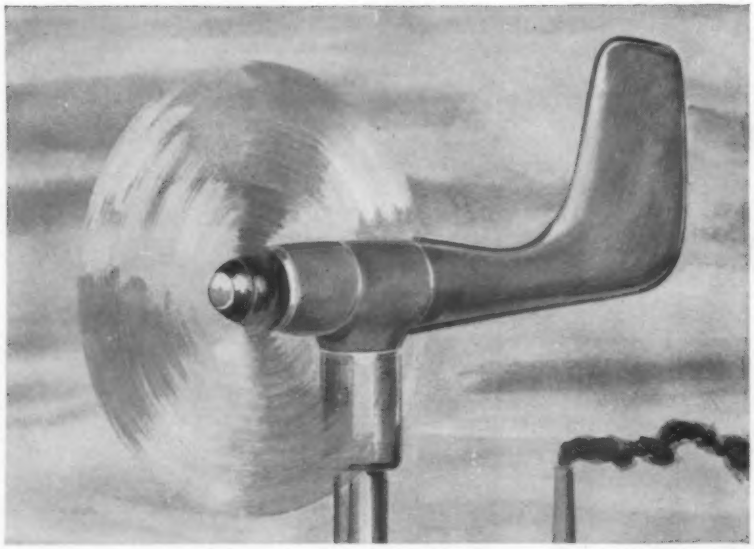
PROTECTIVE COATINGS

BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N.Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

OVER 100 YEARS OF EXPERIENCE

Allied Chemical

For more facts circle 648 on Reply Card



The Aerovane Transmitter detects wind speed and direction, electrically transmits data to indicator and recorder, and actuates control mechanism.

BENDIX AEROVANE* SYSTEM HELPS SOLVE AIR POLLUTION PROBLEMS

Indicator shows wind speed and direction. Calibrated in compass degrees and miles per hour.

Recorder inks wind speed and direction on time-calibrated chart. At normal setting, operates continuously for two-week period.

Optional indicator-controller reduces operating cost of blowers, deodorizers and scrubbers by providing automatic on-off control.

Here's how you can relieve air pollution problems in connection with your plant—and, incidentally, save your company endless headaches. The Bendix-Friez Aerovane System can be of tremendous value to you in eliminating costly and bothersome litigation, saving you money and building good public relations in the community where your plant is located.

If your stacks emit an odorous or possibly dangerous effluent, you must take steps to prevent it from harming personal health, crops or residences in the surrounding area. Bendix-Friez Aerovane System can help do the job as economically as possible.

Here's how it works. When winds are from an unfavorable quadrant, and blowing at velocities which indicate the likelihood of injurious fall-out, your Aerovane System goes to work. It actuates your blowers, deodorizers and scrubbers *only* when conditions require their use. At the same time, the Aerovane Recorder keeps a continuous and accurate, permanent record of *both* wind direction and speed. If litigation does develop, you'll have unquestionable evidence of wind conditions at any given hour.

In addition, the recorder provides an opportunity for the study of wind gustiness, an important factor in predicting the behavior of an effluent from a stack.

These are just a few of the reasons why you ought to investigate the Bendix-Friez Aerovane System if you have a factory-based pollution problem. Write today for full details. Bendix-Friez, 1474 Taylor Avenue, Baltimore 4, Maryland.

*REG. U.S. PAT. OFF.

Friez Instrument Division

Bendix AVIATION CORPORATION

For more facts circle 649 on Reply Card

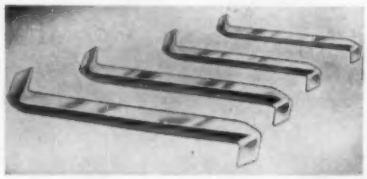
NEW PRODUCTS

(Begins on page 188)

response now available with standard industrial machines. Manufacturer says armature inertia of the entire line has been decreased by as much as 55 per cent in some ratings—and commutating ability increased by 35 per cent. Westinghouse Electric Corp.

82—OFFSET SCREWDRIVERS available in four sizes

For screwheads in hard-to-reach spots, these screwdrivers have a square body with the bit end offset and forged at a



45-deg angle to permit easy use around, behind or under obstacles. They are forged from vanadium chrome tool steel, plated and polished, and offered in four sizes from 4 to 6½ in long. The largest of the screwdrivers has a bit size of 5/8 by 3/32 in. Owatonna Tool Co.

83—PUMPS, high capacity, for severe services

For capacities up to 25,000 gpm in the petroleum, pulp and paper, and other industries, the 24-in Fig. 3420-3423 Pumps are introduced. The two units differ only in the lower half casing. Fig. 3420 has horizontal suction and discharge; Fig. 3423 has vertical bottom suction and horizontal discharge. These single-stage, double-suction pumps have horizontally split casings with upper and lower half bolted and dowelled together. Removal of upper half casing permits inspection and removal of entire rotating element without disturbing suction and discharge piping or pump and driver alignment, it is noted. The pumps have renewable type casing wearing rings to maintain proper running clearance with impeller hub and to minimize leakage between suction and discharge chambers of casing. Impeller wearing rings can be furnished when desired. Goulds Pumps, Inc.

84—STARTER for full motor acceleration

This method of two-step increment starting for induction motors provides reduced light flicker and quieter motor operation during acceleration, it is announced. Major application is expected to be in large commercial buildings and other locations where power companies require large induction motors be started with reduced kva inrush. Typical uses are air conditioning and refrigeration compressors, fans, pumps, blowers. The new system, called a two-thirds part-winding starter, will accelerate most loads to full

stop condensate backup

Nicholson steam traps discharge condensate and air from steam lines and equipment *faster* than any other trap of comparable size . . . help you make full use of your steam dollar. The reason—the effective use of a large orifice. A ½″ Nicholson trap has a greater discharge capacity than most 1¼″ traps . . . and costs less, too!

And that's not all. With just one thermostatically-operated moving part, there's nothing to get out of order, nothing to go wrong. Nicholson means continuous and low-cost operation of your steam-using equipment . . . no downtime from trap failure.

- **powerful valve action . . . no mechanical linkages to cause trouble.**
- **small and lightweight . . . easy to pipe and support.**
- **each unit steam-tested before shipment.**

So, to get a trap that discharges faster, saves money, specify Nicholson. W. H. NICHOLSON AND COMPANY, 14 OREGON ST., WILKES-BARRE, PA. *Sales and Engineering offices in 98 principal cities.*

Write for Bulletin 1055

NICHOLSON
of Wilkes-Barre

For more facts circle 650 on Reply Card

Cut process cooling costs with . . . .

Marley Double-Flow Aquatowers*

In industrial processing plants there is an increasingly popular way to provide process cooling water at lower cost. The answer is Marley's Double-Flow Aquatower, an intermediate-capacity cooling tower that combines top performance, operational flexibility, power economy and minimum maintenance — all in one trim package.

The unit pictured is a 2-cell Double-Flow Aquatower — a unit unequalled in the field of intermediate-capacity cooling for performance and *flexibility*. The operator has as many options as there are varying cooling requirements. He can shut down either cell for routine maintenance while the other continues to operate. Water loading can be varied as desired with no reduction in performance. Pump horsepower requirements, too, are always held to a minimum by the low silhouette design and Marley's unique distribution system.

The Double-Flow Aquatower's flexibility and big-time performance with small-time upkeep makes it a natural for industrial processing plants. Write today for information — or better yet, simply call your nearby Marley Engineering Sales Office in any of 55 cities.

*Trademark Reg. *U. S. Pat. No. 2776121

MARLEY

The Marley Company

Kansas City, Missouri

For more facts circle 651 on Reply Card

NEW PRODUCTS

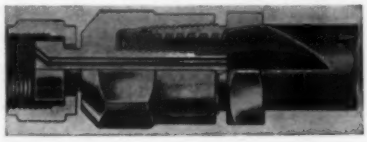
(Begins on page 186)

speed on the part winding, it is explained, and this eliminates the second increment of current inrush characteristic of conventional part winding starting.

Company says this starter, the CR7050, is easily connected for conventional one-half part-winding starting as well as the two-thirds method. Simple reconnection of leads of a standard 208-220/440-v motor to the new control is all that's required, according to company. The starter comes in ratings to 400-hp, 600 v. Its four-two pole arrangement is claimed to make possible one of the most economical of reduced-current starter-motor combinations. It consists of two contactors and a pneumatic time-delay contact. Enclosures are available in NEMA types for general purpose, water-tight, explosion-proof and industrial service. General Electric Co.

85—HOSE, COUPLINGS with double-wedge grip

The Surgepruf line of medium and high-pressure hydraulic hose and hose couplings is introduced as featuring the double-wedge grip to eliminate need for skiving rubber covered wire braid hose. The couplings, which may be used over



and over again, are designed to bite through the rubber cover, grip on either single or double wire braid hose without weakening the protective cover or waterproofing qualities of the hose. The "non-skive" feature not only saves time and labor, but provides a hose connection always at full metal-to-metal strength, company notes.

To assemble the couplings, it is not necessary to use a mandrel to flare out the hose in the socket. Since the insert and hose end are both exposed before the socket is engaged to the bushing, the insert can be "rolled" into the hose without a possibility of gouging—as with many couplings, it is pointed out. Surgepruf Hose, constructed of seamless inner tube of synthetic rubber reinforced by steel wire braid, has an operating temperature range of -40 to 275 F, and a burst range of 1400 to 18,000 psi. Alemite Div., Stewart-Warner Corp.

86—POSITION INDICATOR for remote valve operation

Operation and position-indication of located valves, gates, feeders or other devices is reported possible with Synchro-Scan Position Indicator-Controllers. They are designed to permit remote modulation and continuous indication of valves or similar devices. This is accomplished

Connecting the leads for a motor control panel, resetting a reconditioned drive motor, or running in some new bench outlets for power driven hand tools give you or your electrical contractor perfect opportunities to benefit by Graybar service. Your nearest Graybar warehouse has — ready for prompt delivery — the right product for every wiring need.

When your plant needs supplies for WIRING your best source is Graybar

Take tape, for example. Naturally, you need guaranteed results when using friction, rubber or plastic tape. When you order one roll, a shop-package, or a case from Graybar you can count on quality — and fast delivery, anywhere.

Also, you can count on your nearest Graybar warehouse — and there are over 130 of them — for the best in insulated wire; for thinwall, heavywall, fibre, aluminum, steel and copper conduit — all made by first line manufacturers. Remember that whether you or your electrical contractor needs tape, wire, or conduit for routine maintenance or when planning the complete wiring of a new plant, your requirements can be met from the widest selection of electrical equipment available anywhere — *Graybar*.

737-326

WRITE FOR YOUR FREE SAMPLE

If your firm is located in the U. S. or its possessions, Graybar will be glad to mail you sample rolls of AMAZON Friction Tape and AMAZON Rubber Tape. Write for them!

CALL GraybaR FIRST FOR

GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK, IN OVER 130 PRINCIPAL CITIES

For more facts circle 652 on Reply Card

How to handle acid wastes with a drainline depreciation of 1/200 per year

If you had to dispose of 5% hydrochloric acid at 212°F. you would probably expect frequent and costly replacement of your drainlines.

That is unless you installed PYREX® brand "Double-Tough" glass pipe.

Even handling acid wastes as corrosive as hot hydrochloric, you could expect your PYREX pipe to last upwards of 200 years . . . for this solution would only eat away a scant three ten-thousandths of an inch per year.

Because PYREX pipe is transparent you can *see* conditions in the line at any time. It's easy to trace stoppages. The pipe is mechanically strong, too, from a glass formula that is made for industrial use.

There's virtually no maintenance problem . . . and installation is as easy as that of ordinary pipe. Your own pipe fitters can install it . . . in sizes from 1″ to 6″.

Bulletin EA-3 tells the whole story of PYREX brand "Double-Tough" glass pipe and catalogs the complete line of pipe sizes and fittings. We will be glad to send you a copy.

Corning means research in Glass

CORNING GLASS WORKS

10-6 Crystal Street, Corning, New York

For more facts circle 653 on Reply Card

NEW PRODUCTS

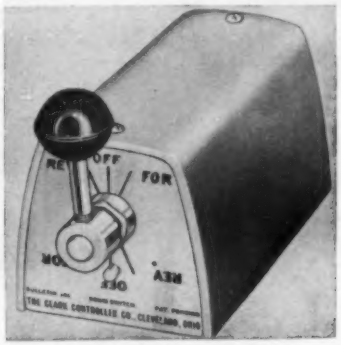
(Begins on page 188)

through the transmitter package (a plug-in unit) which has a three-position (open, close and off) switch mounted on its face to control the device. Above this switch is a small voltmeter-type indicator graduated from 0-100 per cent to indicate per cent of opening. At the receiving end, another packaged unit contains control relays and regulated d-c voltage supply used to transmit position indication. A standard electric position transmitter is used to originate voltage. Only two wires and ground are required for signal transmission. Builders-Providence, Inc.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 269-270.

87—DRUM SWITCHES for small motor applications

Three recently introduced drum switches are offered for reversing across-the-line starting of small conveyors, shop tools, door operators, oil burners, and other applications for small a-c or d-c motors. One model, Type IR is designed



to permit instant reversing of standard single-phase a-c motors. Company points out that with the Type IR, it is not necessary to buy a special motor for applications where it is inconvenient to wait until the centrifugal switch closes before reversing. Type PR models, for conventional reversing duty, are convertible in the field between maintained-contact action and "spring return to off".

In standard form the switches are furnished in NEMA 1 enclosures for surface or flush mounting. Ratings are ¼ hp for d-c motors, 1 hp for 115-v single-phase a-c motors, 1½ hp for 230-v single-phase a-c motors, and 2 hp for 220-550-v two- or three-phase. Clark Controller Co.

88—VARNISHED TAPE is improved insulation

Fibremat Varnished Polyester Web Tape is said to have higher dielectric strength,

HANDLING HEAVY STEEL BEAMS in the big yards of a West Coast structural steel fabricator is an American 300 Series Self-Propelled Crane. In busy yards, large or small, with wide or narrow aisles, American's fast, easy maneuverability is essential to maintain peak materials handling volume.

YARD CRANE'S SPEED, MOBILITY KEY TO EFFICIENT PERFORMANCE

In large, busy yards, American Cranes meet industry's demand for mobility and speed. No matter what size your yard is, you'll find that this ability to maneuver quickly in tight spots, roll smoothly down aisles pays off in increased materials handling volume.

You can perform *all* yard crane jobs—and many in-plant jobs, too—with these versatile cranes. Bulk handling, loading and unloading, transferring materials, moving equipment, building erection and maintenance work are typical routine tasks! American Cranes give you a choice of interchangeabie fronts: crane boom, clamshell, dragline, backhoe, shovel, grapple or magnet!

Power, speed and spotting accuracy set American's fast, productive pace. An optional two-speed transmission, responsive controls and excellent machine balance maintain high safety factors, even with maximum loads!

"Fast, efficient and dependable on every yard job!" That sums up industry's reports on American Cranes. Rugged, job tested design and close quality control in manufacture result in lower operating costs—a fact you can prove by personally talking to owners and operators. Ask your nearest Distributor to show you Americans on the job. You'll find their performance in every industry outstanding. Remember, there's an American Crane in exactly the size and type for your job—on crawlers or rubber, from 12½ to 50 ton capacities!

AMERICAN HOIST
and Derrick Company

Saint Paul 7, Minnesota

For more facts circle 654 on Reply Card

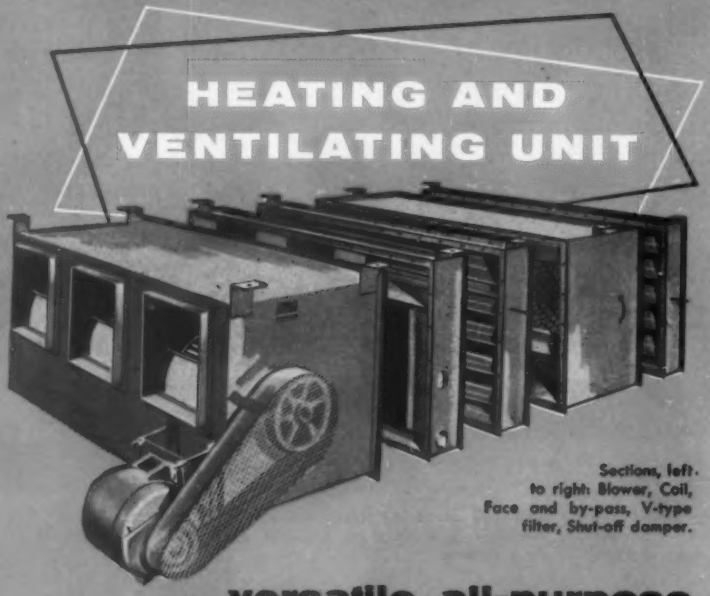
(Begins on page 188)

lower power factor, lower moisture absorption and greater conformability than many varnished insulations. It is rated as a Class A insulation material, and suggested for wrapping field coils, phase insulation in electric motors, insulating generators and transformers and for cable insulation and splicing. General resistance to water, salt water, acid and alkalies is described as excellent.

An important property of the tape, according to company, is extreme conformability. Due to the ease of elongation of its polyester web base, the tape can be pulled down tightly while wrapping to eliminate air pockets or voids. Elongation of the tape has no marked effect on its dielectric properties, it is noted. This ability to deform only at point of pressure is attributed to the non-continuous fiber base. The same property improves the tape's tear resistance. This tape is made up of a mat of non-woven polyester fibers in a felted form, impregnated with a varnish coating. The polyester base serves to provide a material which can be stretched without losing electrical properties, and since this base is virtually moisture-proof, wicking of moisture, common to many base fabrics, is claimed solved in Fibremat. The tape comes in 7- and 10-mil calipers in black or yellow varnish. Widths range from ⅜ to 2 in. in 36-yd rolls. Irvington Div., Minnesota Mining and Mfg. Co.

...the Make-Up AIR family proudly presents a new addition...

HEATING AND VENTILATING UNIT



Sections, left to right: Blower, Coil, Face and by-pass, V-type filter, Shut-off damper.

...versatile, all-purpose interchangeable components for Make-Up AIR and general ventilation applications...

The Make-Up AIR, using Steelfin coil, now adds to its family a heating and ventilating unit, using Aerofin copper coil. All sections are individually supported, have external flanges, and are removable for maintenance or replacement. Nine basic blower sections are available, in any desired rotation. Write today for our bulletin 567.

nyb THE NEW YORK BLOWER COMPANY
SALES OFFICES: 3163 SOUTH SHIELDS AVENUE • CHICAGO 16

For more facts circle 655 on Reply Card

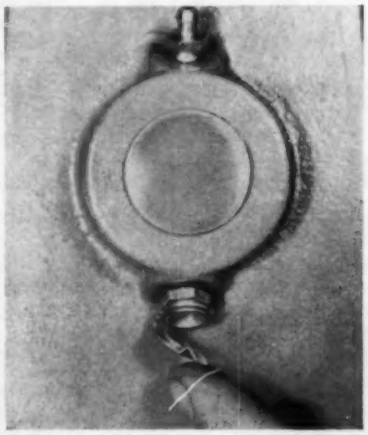
89—PORTABLE BENCH for industrial use

Port-A-Bench supports up to 1000 lb, it is noted, yet stands by itself when folded. Features announced include wide,

¾-in. thick plywood, non-conductive safety steps, rubber covered feet, riveted steel construction. The folding mechanism is designed to permit one-hand operation plus compactness when folded. It costs less than $13.00 and its shipping weight is around 15 lb. Anderson Mfg. Co.

90—RELIEF-TYPE FITTING to speed bearing lubrication

For use on antifriction bearings in motors, machinery, pillow blocks, or any ball or roller bearing housing equipped with conventional relief plugs, the RT Fittings have a "flip-open" cap that simplifies bearing lubrication. The body of this fitting is internally flared to allow free discharge of excess grease. These fittings make the use of relief plugs unnecessary. According to company engineers, tests show that the RT Fittings cut lubricating time by 80 per cent. Although the cap is held tightly in place by spring tension, it snaps open or shut with the flip of a finger, manufacturer states, and the cap, which swivels to any position so it is easy to reach. Because it is attached to the fitting, this cap cannot be misplaced. Keystone Lubricating Co.



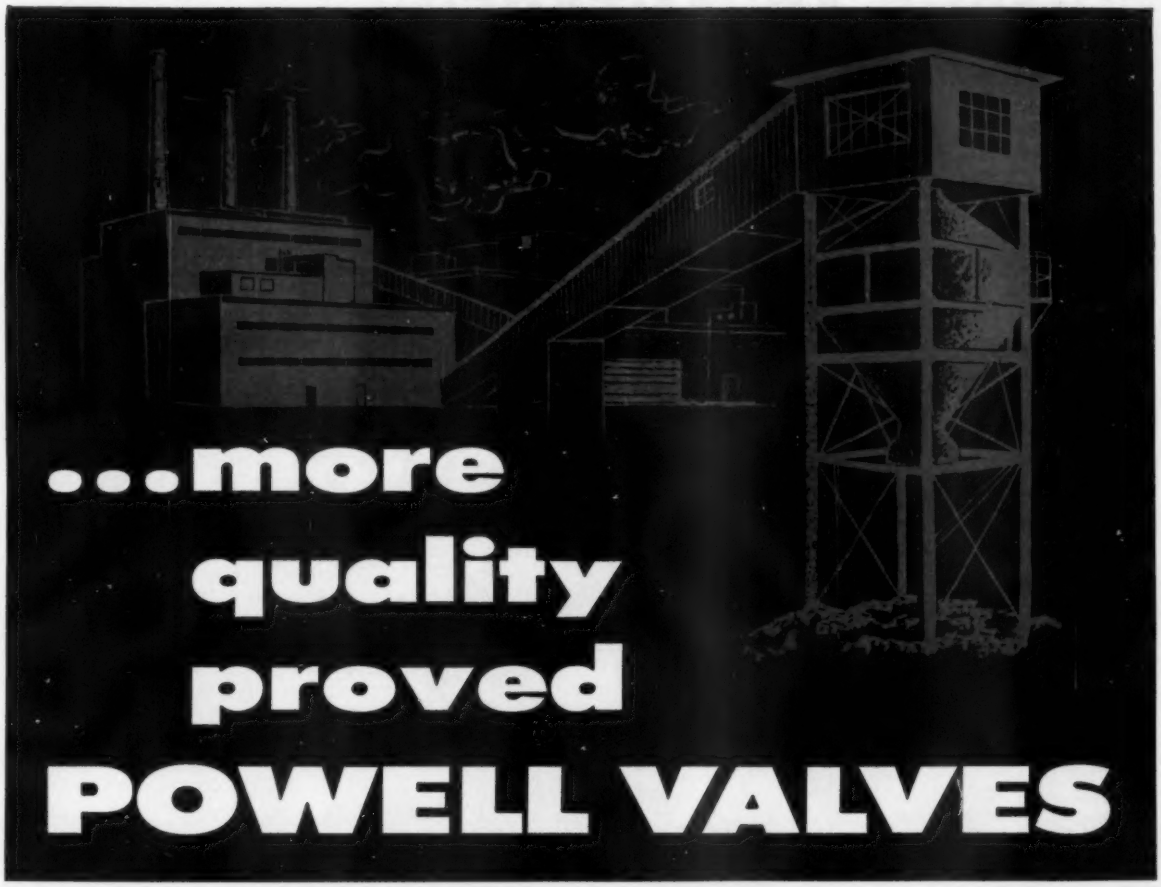


FIG. 9003 W.E.—
900-Pound Steel Gate
Valve, Bolted Flanged
Yoke, Outside Screw,
Rising Stem.

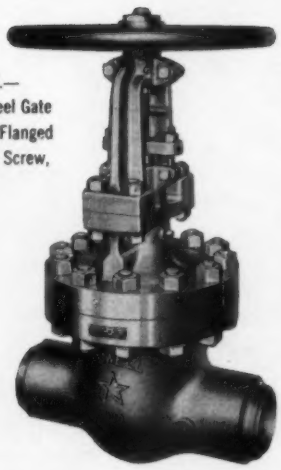


FIG. 375—Bronze Gate Valve
for 200 Pounds W.S.P. Inside
Screw Rising Stem.

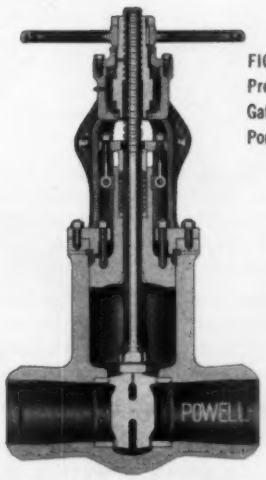


FIG. 11303 (Sec.)—
Pressure Seal Steel
Gate Valve, 1500
Pounds. Welded Ends.

Designed for long life, designed for dependable service

Consult your Powell Valve distributor for all the facts about quality proved bronze, iron, steel and corrosion-resistant valves. For every flow problem . . . there is a Powell Valve to solve it.

THE WM. POWELL COMPANY, CINCINNATI 22, OHIO . . . 111th YEAR
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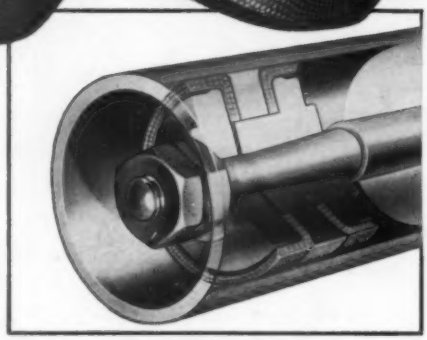
PUMCUP ADVANTAGES

now yours for

- HYDRAULIC CONTROLS
- AIR CYLINDERS
- RECIPROCATING PUMPS

Two common Pumcup types: conventional and 45° bevel type . . . available in a complete range of sizes and texture-engineered compositions.



Cutaway view of typical Pumcup installation resulting in prolonged high efficiency.

TAKE it from experienced users, Darcova Pumcups offer payoff advantages that can't be equalled! For example, they last many times as long as ordinary piston packing..and they *hold peak efficiency* from start to finish. Because of the resulting production and maintenance economies, plant after plant is standardizing on Pumcups.

Improved application of the cup principle does the trick. And Darcova Pumcups are *texture-engineered* in *a range of compositions* to meet most temperature-pressure-fluid conditions. And they are available in sizes and types exactly right for your particular equipment.

It will pay you to get *all* the facts. Just ask for Pumcup Bulletin No. 5503.

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
PUMCUPS

For more facts circle 657 on Reply Card

NEW BOOKS

for the plant engineer

Business Action

BUSINESS ACTION IN A CHANGING WORLD. Size 9¼ x 6¼ in.; 311 pp including index; cloth bound. Published by Public Administration Service, 1313 East Sixtieth St., Chicago 37, Illinois. Price $5.00.

OVER TWENTY PERSONS have contributed indirectly to this book presented in four principal sections, namely changes facing the manager of tomorrow; adjusting to changing conditions; management action in specific areas; the guaranteed annual wage and business stabilization. Material has been reprinted from other publications and compiled into this informative volume.

Among the subjects explored in this book are the following: basic trends and their challenge to management; automatic control of operations; atomic revolution; breakup of the business cycle; long term security for private industry; product planning; flexibility of plant and facilities; methods of company employment stabilization.

Arc Welding

PROCEDURE HANDBOOK OF ARC WELDING Design and Practice. Size 9 by 6 in.; over 1300 pp; illustrated; cloth bound. Published by the Lincoln Electric Co., Cleveland 17, Ohio. Price $3.00.

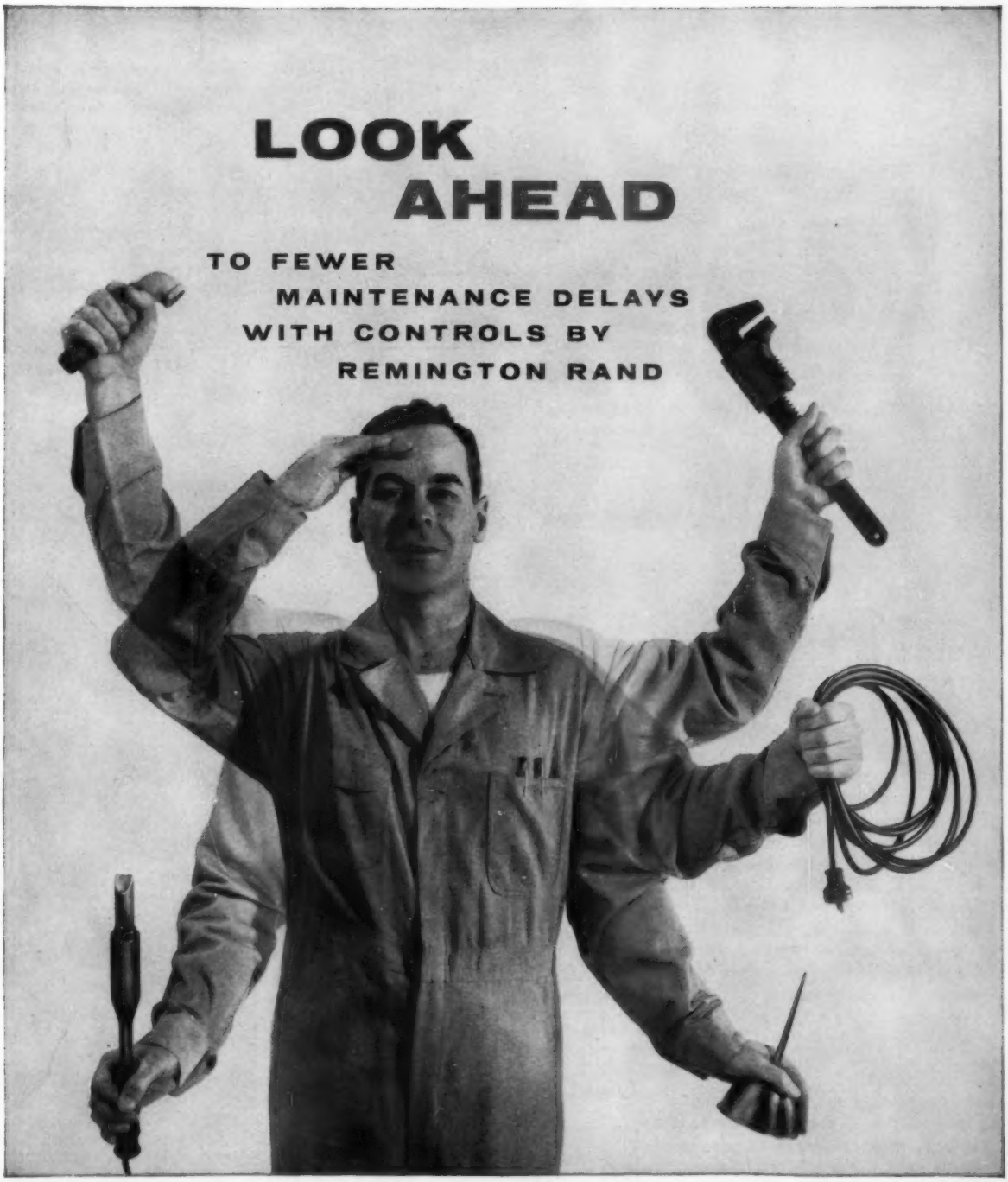
ALL OF THE PREVIOUS EDITION of this handbook has been closely reviewed and the material brought up-to-date in this eleventh edition. The contents range from the early history of arc welding to structural design.

The book is divided into eight sections and each such division has its own table of contents. Topics covered in these sections are as follows: history; processes, equipment, and nomenclature; techniques, procedures, speeds and costs for welding steel; weldability of metals; basic design and production data for lowest cost fabrication; machine and structural design; and applications.

Analysis Methods

ANALYSIS FOR PRODUCTION MANAGEMENT by E. H. Bowman and R. B. Fetter. Size 9¼ by 6¼ in.; 503 pp including index; cloth bound. Published by Richard D. Irwin, Inc., Homewood, Illinois. Price $7.80.

THIS BOOK PRESENTS analysis methods that deal with programming, sta-



Many arms are needed to perform the functions of maintenance. But, how much easier it is to perform when you can control and direct these arms.

Preventive maintenance is look ahead maintenance ... a visible system of planned controls that schedules maximum productivity with a minimum of time and money expenditure.

Consult your Remington Rand maintenance specialist for a cost-saving system that best fits your requirements. He has simplified controls for visibly charting and coordinating your maintenance operation. Write Room 1646, 315 Fourth Avenue, New York 10, N.Y. Ask for free booklet X1383 — "Assured Equipment Productivity Through Maintenance Management."

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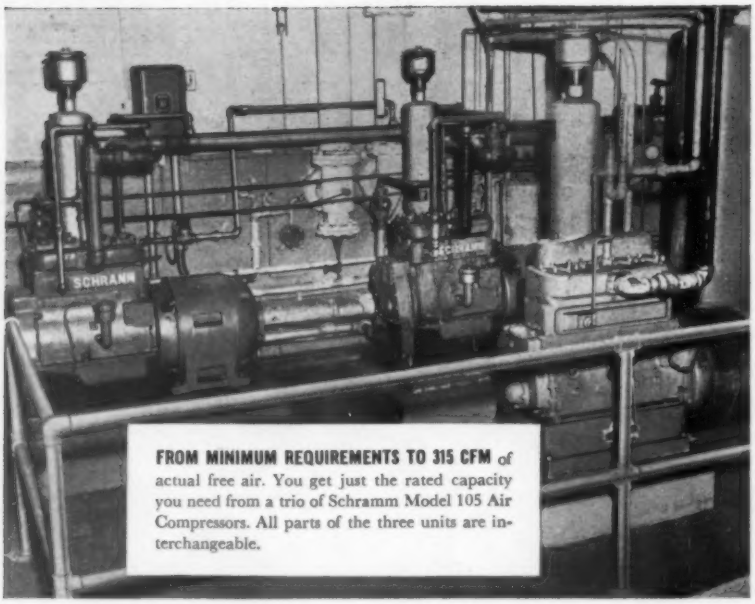


FROM MINIMUM REQUIREMENTS TO 315 CFM of actual free air. You get just the rated capacity you need from a trio of Schramm Model 105 Air Compressors. All parts of the three units are interchangeable.

SCHRAMM TRIO VOTED MOST FLEXIBLE:

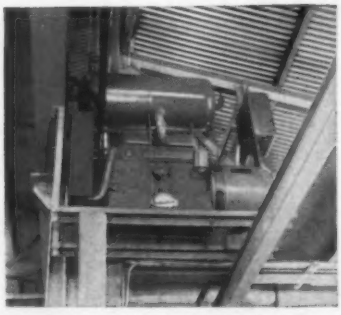
"From 105 to 315 CFM at a moment's notice"

Here's utmost flexibility in compressed air supply. Three Schramm Unistage Model 105 Compressors can be changed at a moment's notice to operate at 105—210—or 315 cfm capacity!

Individually equipped with 25 hp motors, these units provide fast, positive control of air-actuated machines of all kinds. Arrange them in a battery, or individually in a department. Their motors operate at full capacity to give them top efficiency. And no other compressor is so compact—so saving of space.

Besides saving space, Schramm Compressors offer features found in no other machine. Schramm units of all sizes produce full rated capacity at 100 lbs. Balanced reciprocating parts eliminate vibration and cut down wear on bearings. And Schramm engineered cooling systems permit continuous operation without danger of over-heating.

Catalog 5510 describes our Industrial Air Compressors. Write today for your free copy, without obligation. Or call your local Schramm Dealer; he's listed in the Yellow Pages of the Telephone Directory.



MOUNT ANYWHERE TO SAVE SPACE. Schramm Model 105 Air Compressor and Direct Drive Motor mounted on overhead beams in welding plant. Assembled rigidly and in perfect alignment, compressor and motor take up only a fraction of space required by other makes and designs.

NEEDS NO FOUNDATION. Balanced reciprocating parts in Schramm industrial compressors assure vibrationless operation and permit installation without expensive foundations. Schramm units can be set up in almost any out-of-the-way location.

Schramm, Inc.

MANUFACTURERS OF AIR COMPRESSORS

665 North Garfield Ave. • West Chester, Pa.

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tistics and economics. Each method is illustrated by a specific manufacturing example relating theory to actual production problems. The methods are capable of being applied to realistic situations. For a more thorough appreciation of material in this book it is advisable that the reader have a knowledge of mathematics including Calculus.

In the orientation section of the book, there is a chapter on schematic models, such as the following: flow process charts, operator charts, and assembly diagrams.

Some of the other topics of discussion are: statistical control, sampling inspection, total value analysis, and equipment investment analysis.

Engineering Mechanics

MECHANICS FOR ENGINEERS by F. P. Beer and E. R. Johnson, Jr. Size 9¼ by 6½ in.; illustrated; cloth bound. Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 36, N.Y. Price $8.00.

OBJECTIVE of this textbook, written for courses in statics and dynamics, is to provide a highly complete coverage. In addition, the aim is to have ex-

planations which are as clear and simple as possible without affecting a high standard of accuracy. Also, part of the objective is to furnish carefully chosen examples and problems of unusual quality and interest.

Statics of rigid bodies is presented with two and three dimensional approaches. In dynamics, three basic methods of analysis are first applied to problems involving particles, so that the student may learn their respective advantages before tackling the motion of rigid bodies.

A few of the specific topics treated in the 19 chapters are as follows: analysis of structures, forces in beams and cables, friction, method of virtual work, mechanical vibrations, centroids and centers of gravity, and moments of inertia.

It's up there...

FOR YEARS OF DEPENDABLE SERVICE... this...

Showing Fan Under Construction At Bayley Blower Co.

Bayley R.D.D. MEDIUM-SPEED INDUCED DRAFT FAN

...RECENTLY INSTALLED ATOP THE NEW 1¼ MILLION BARREL CAPACITY MILWAUKEE PLANT OF THE MARQUETTE CEMENT MANUFACTURING CO.

First of its type in the U. S., this large medium-speed BAYLEY-built mechanical draft fan is specially designed to induce air through cement clinkers, during processing operations at Marquette Cement Mfg. Company's new Milwaukee plant. The open air installation is typical of today's trend in mechanical draft installations.

Due to particularly severe performance demands in cement processing, Bayley's high standards of craftsmanship assure longer, more dependable fan service life . . . a fact attested to by the many instances in which BAYLEY equipment has been selected by the leading producers in the industry.

Engineered Air Handling Equipment

Bayley

WRITE for *Bayley FAN-O-GRAPHICS*—A Guide for Specifying and Operating Centrifugal Fans.

...BLOWER COMPANY

1825 South 66th St. Milwaukee 14, Wisconsin

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NEW CARBON GRAPHITE
Self-Aligning
PILLOW BLOCKS
(Metal Encased)

. . . OPERATE HOT or COLD WET or DRY

WITHOUT LUBRICATION!

- In ovens or dryers to temperatures of 800°F.
- Without attention in inaccessible locations
- Operate where oil or grease lubrication cannot be used (eliminates contamination)
- Avoid wear on shaft and bushing from lint and dust gathered by oil film
- With the self-aligning feature, the bearing will conform up to 5% any shaft misalignment
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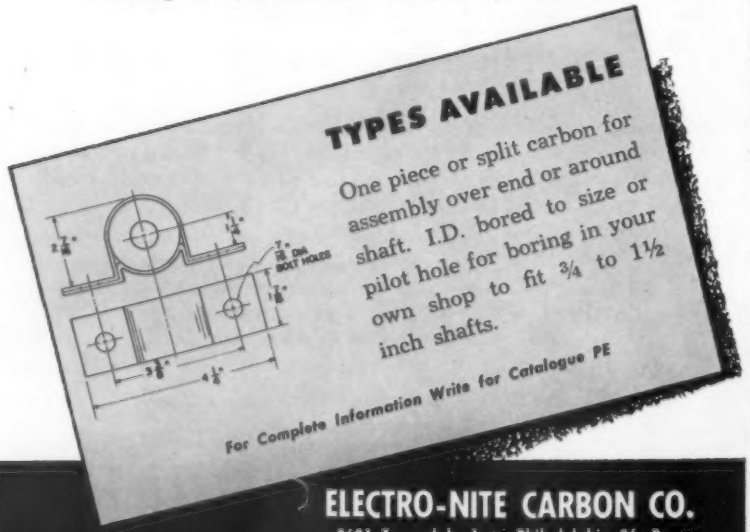
TYPES AVAILABLE
One piece or split carbon for assembly over end or around shaft. I.D. bored to size or pilot hole for boring in your own shop to fit ¾ to 1½ inch shafts.
For Complete Information Write for Catalogue PE

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OR YOUR LOCAL BEARING DISTRIBUTOR

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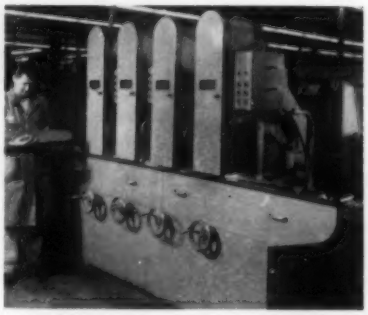
INDUSTRIAL FILMS

Abrasive Belt Grinders

A 16-MM, 18-minute sound and color film, "Two Heads Are Better Than One," features a series of multiple-head, conveyor-type abrasive belt grinders. The film shows action sequences of various models.

A four-head model, using a series of progressively finer-grit belts, is



shown surfacing chain saw bars in a single automatic grinding sequence. A two-side adaptation, with grinding heads on different levels and a turn-over conveyor setup, is shown finishing both sides of phenolic printed-circuit sheets.

Other installations include a two-head model equipped with special molded rubber conveyor belt for rapid loading and automatic parts ejection; and another two-head model whose coolant system, by efficient flushing and collecting of grindings, overcame the problem of costly material loss formerly encountered in surfacing multi-layered gold alloy bar stock.

A new automatic rotary abrasive belt grinder for high speed precision grinding and finishing of outside diameters is also featured. Film can be obtained by writing to Engelberg Huller Co., Inc., 831 West Fayette St., Syracuse 4, New York, attention John Simmons, Product Manager.

Insulating Tape

"ALL HOLES BARRED," a 20 minute long color movie, shows the correct application of vinyl pipe insulating tape for corrosion prevention. Corrosion principles are presented in a very elementary manner with cartoon characters dramatizing the effect of electrolysis on unprotected and faultily protected pipe. Step-by-step sequences show methods of insulating couplings, street "T" fittings, weld joints and elbows, as well as straight sections of pipe. The use of taping machines and shortcuts for hand wrap-

The FALK all-steel Shaft Mounted Drive

- Versatile
- Efficient
- Economical
- Compact

SIX SIZES—½ TO 30 HP—420 to 10 rpm—single and two double reduction ratios—output torque ratings up to 21,000 lb-in.

To Plant Engineers:

The versatility of the Falk Shaft Mounted Drive makes it the practical choice for many machines in your plant.

This compact unit mounts on the driven shaft, thereby solving many problems of restricted space. You can obtain almost any output speed between 420 and 10 rpm by selecting the proper single or double reduction unit and the proper sheave or sprocket ratio.

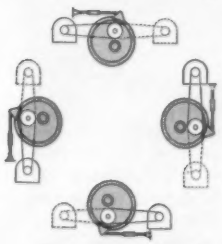
Do you need both horizontal and vertical drives? Standard Falk Shaft Mounted Drives are available for either application; or you can easily convert a horizontal unit to a vertical unit, right in your plant.

Initial cost is low, you get immediate delivery from shelf stock, and installation is quick and easy.

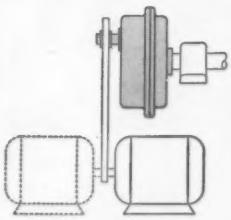
★

FALK Shaft Mounted Drives are available from factory and distributor stocks *from coast to coast*. See your Falk Representative or Distributor—or write direct for your copy of **Bulletin 7101.**

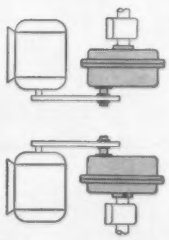
A few of the many ways this reducing unit can be applied—



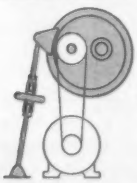
ANY POSITION



MOTOR EXTENDED —or below the unit

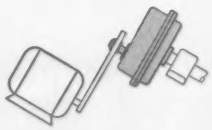


VERTICAL—UP or DOWN



VARIABLE SPEEDS... through use of variable-pitch sheaves—automatic belt adjustment with tie-rod adjustment

OVERLOAD RELEASE... that will slacken belts and cut off power if overload occurs



INCLINED SHAFT... Any standard unit can be mounted in vertical or inclined position by a simple rearrangement of oil drains

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...a good name in industry

yes ANY STORAGE RACK LETS YOU STACK FOR EXTRA SPACE—

New warehouse of Butler Brothers
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but ONLY STURDI-BILT makes storage space SO VERSATILE!

- Quickly erected!
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- No tools, nuts, bolts or welding!
- No special labor needed at any time!
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- All parts 100% reusable!
- Safe loading of bars up to 8,000 lbs. per pair.

Sturdi-Bilt makes the most of your storage facilities! It doesn't matter what you store — how much, how heavy or how big — Sturdi-Bilt Racks are *simply* adjusted to meet your need.

No "One Way" storage system here — instead you receive complete freedom in types of storage— Pallets, Skids, Dies or Bulk — plus flexibility for variations in size, and economies in set-up and daily use.

Only STURDI-BILT Racks have
"Float Wedge Construction"
1. Simply insert Sturdi-Bilt Wedge Lock . . .
2. . . . into the slots in the factory pre-fabricated upright frame . . .
3. . . . and lock to the horizontal safety support bars.
3"
Store from either side — there's no sway or cross bracing.
Space your openings anywhere on 3" centers — simple to place — quickly respaced.
Flush decking design eliminates obstructions for easy placement and removal of goods.

Sturdi-Bilt

U. S. Patent No. 2760650 Other patents pending.

WRITE FOR FOLDER No. PE-67

Sturdi-Bilt Engineering Company

2501 Peterson Avenue Chicago 45, Illinois

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ping tape are also illustrated and explained.

"All Holes Barred" may be obtained for free showing through branch offices and salesmen of Minnesota Mining and Manufacturing Co.

St. Lawrence Seaway Progress

"THE EIGHTH SEA," 28½-minute documentary type film tells the story of the planning and development of the St. Lawrence Seaway. Walter Cronkite, television commentator, narrates the film taking the viewers over the entire length of the waterway from the Atlantic to the Great Lakes. The audience sees the construction of huge coffer dams; watches the rapids being moved aside; the diversion of a river from its natural bed so that the men can work on dry ground.

The film is available through the nearest Caterpillar Tractor Company dealer or by writing the Advertising Division of the Caterpillar Tractor Company, Peoria, Illinois.

Arcwelding Safety

NEW 20 minute, sound slide film, "Always On The Job," covers the basic principles of safety in electric arcwelding. The film features a light, cartoon approach to the subject. Record is 33⅓ rpm speed.

This film is available from any Air Reduction Sales Company office on a free-loan basis or may be purchased for $15.00.

Lift Truck Developments

DEVELOPMENTS and improvements in lift trucks are illustrated in a 10-minute, 16-mm, color and sound film.

On-the-job scenes filmed at various types of industries show lift trucks of 2000-, 3000- and 4000-lb capacity at work.

Reservations to view the film without charge can be made through Hyster Industrial Truck Dealers or Hyster Company, 2902 N. E. Clackamas Street, Portland 8, Oregon.

for longer valve life

in a variety of corrosive services

JENKINS NI-RESIST GATE VALVES

Where you encounter acids, salt and alkaline solutions, sea water, brine or other corrosive fluids, vapors or gases, you'll want Jenkins Ni-Resist Type 2 Cast Iron Gate Valves with type 316 stainless steel trim. They have a remarkable ability to withstand destructive corrosion and erosion.

In paper mill service, food processing, petroleum refining, chemical plants and other process industries, Jenkins combination of Ni-Resist type 2 cast iron and type 316 stainless steel, plus Jenkins extra *value* construction throughout greatly extends valve life.

Designed especially for corrosive services, the Jenkins Ni-Resist line of gate valves also has superior metal-to-metal wearing qualities. Copper-free, they will not discolor or contaminate products being carried in the line. Let the famous Jenkins Diamond be your guide when choosing Ni-Resist valves . . . it means longer, trouble-free service.

GET COMPLETE INFORMATION
from your Jenkins Distributor, or write Jenkins Bros., 100 Park Avenue, New York 17

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LOOK FOR THE JENKINS DIAMOND
VALVES
TRADE JENKINS MARK SINCE 1864
Jenkins Bros

Sold Through Leading Industrial Distributors Everywhere

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Big Switch to LP Gas

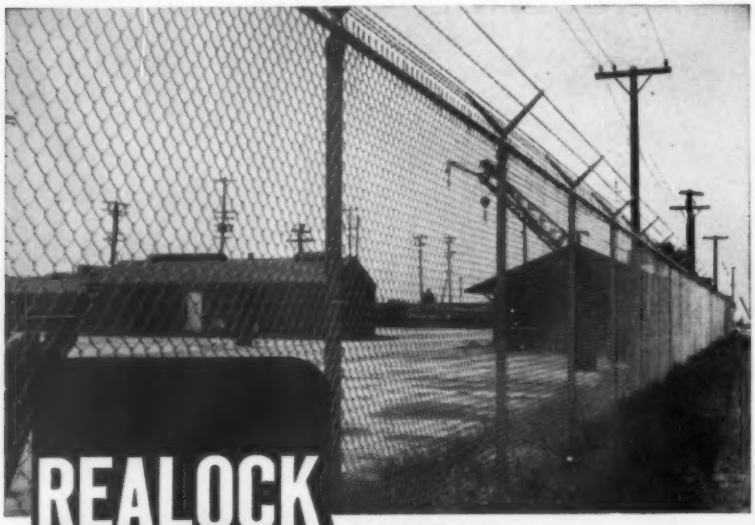
(Continued from page 115)

regulator. Nearby stood an exhibit, a typical fork lift, already converted.

The propane school handled a shift at a time. The company's publication played up the conversion. It was predicted that once the warehouse had completed its big switch to propane, fumes would all but vanish. It was mentioned also that although maintenance would profit by reduced overhaul costs, warehousemen themselves would profit even more. They would be breathing clean air.

Some plants leave refueling to fork lift operators. Certified follows a different procedure. Tests showed that a typical fork lift, operating two shifts, would need refueling twice daily, at 11 am and again at 8 pm. These times fall during work breaks; within them all four-gallon propane tanks are changed. A full tank is substituted, even though the replaced tank might still be partially full.

To streamline the procedure, operators line their machines up in two rows down the main warehouse aisle. Standing by is a "train" of special tank racks. Typical rack, riding on casters, holds 20 four-gallon propane tanks. See Fig. 4. Quickly, refuelers move vehicle to vehicle, changing tanks, returning the empties and partially filled tanks to the racks, and substituting full tanks. The refuel job for the entire 96 unit warehouse fleet is completed in about 20 min.



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helps you

- reduce number of guards
- prevent burglary, arson and vandalism
- stop pilferage

You get all of these advantages and more when you install a sturdy Realock Fence. The tough, heavy fence fabric will give years of service . . . terminal posts are made of full-weight tubular, I- or H-structural steel sections . . . and, for maximum security, Realock Fence is topped with three, five or six strands of tough barbed wire.

What's more, Realock is long-range protection. It's made of full-weight steel that's heavily galvanized after weaving so that it can give years of trouble-free life under all weather conditions.

THE COLORADO FUEL AND IRON CORPORATION, Denver and Oakland
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REALOCK FENCE
THE COLORADO FUEL AND IRON CORPORATION

CF&I

BRANCHES IN ALL KEY CITIES

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"Assured" Lubrication

(Continued from page 106)

proper intervals and in the proper amounts and types. One last question enters our mind. "How can we be sure that our oilers actually do the lubrication? What is to prevent them from signing both of their logs without having done any lubrication?" The answer to this is a problem of proper education and supervision. No device, whether the signing of a log, or the punching of a card on the machine, can insure that the lubrication is done.

Properly educating your oilers in the importance of their job, instilling in them pride in their work, and pointing out the responsibility of their job, all help to make the job of supervision easier. Nevertheless, a periodic check of their work should be made, and every time a machine is down for repairs, or surplussed, or temporarily out of service, the daily and periodic lubrication logs should be checked to see if that machine is listed as out of service, or signed off each day. As the daily and periodic lubrication logs are official company documents, and as the falsifying of these documents is generally a dismissal offense, you should have little trouble, if you acquaint your oilers with this fact.

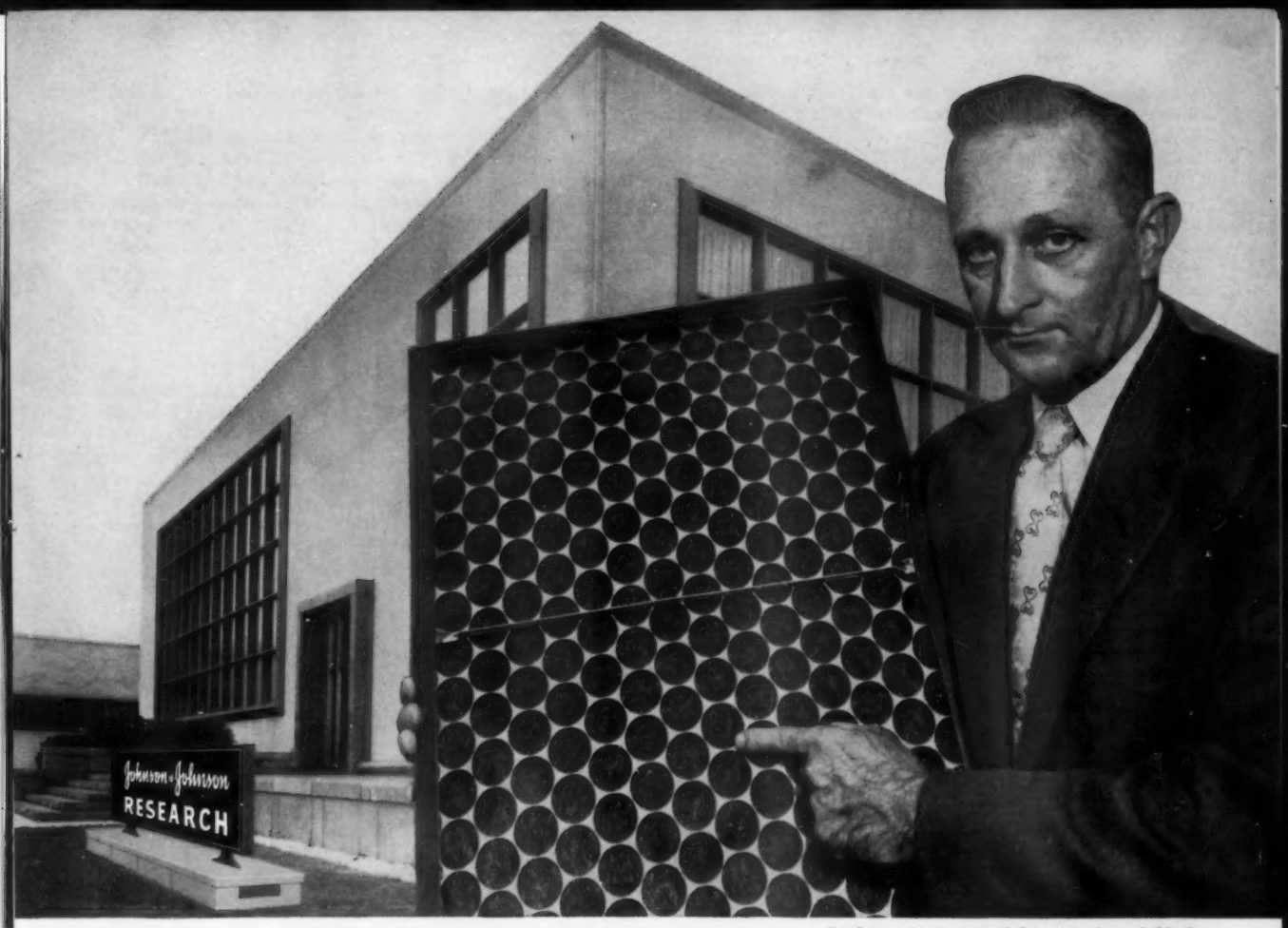
Electrical Air-Break Contactors

(Continued from page 135)

which is in series with the undervoltage relay operating coil. The time-delay opening contact of the undervoltage relay controls sealing of the master relay. This undervoltage circuit has the advantage over most other undervoltage circuits in that the undervoltage time delay becomes a direct function of the contactor drop-out.

The pushbutton station used with this circuit has the conventional start pushbutton and has a maintained stop pushbutton. The pressing of the start pushbutton trips and recloses stop pushbutton contacts. This type of pushbutton was used for simplicity of the circuit and to hold open the stopping circuit during the inherent time-delay drop-out of the undervoltage sealing contact.

The controller circuit, shown in Fig. 3, illustration "b," is provided without time-delay undervoltage restarting. The controller circuit is made



Mr. Bors points to one of the many sizes of Glasfloss Filters used at Johnson and Johnson's research center and other plants and offices in New Brunswick, N.J.

"We like the high efficiency and easy handling of Glasfloss Air Filters"

says Mr. Alexander Bors, Maintenance Supervisor at Johnson & Johnson

In the plant offices of Johnson & Johnson, New Brunswick, New Jersey, employees enjoy exceptionally clean, decontaminated air at minimum costs to the company.

Plant personnel state that the highly efficient filtering action and handling ease of Glasfloss Air Filters have made such results possible. Mr. Charles Sutton, field and maintenance engineer, puts it this way. "After three years of Glasfloss, we are convinced that we have obtained the optimum of filter efficiency and ease of handling . . . more than 90% of the contamination is removed by Glasfloss units . . . an obvious improvement over previously used spun glass filters."

Such results have led the company personnel into planning Glasfloss Filtering for a new surgical dressings research and manufacturing plant now under construction.

What's different about Glasfloss that makes such filtering efficiency possible? First, Glasfloss uses only extremely fine, silky glass fibers that are kind to hands and skin. Lighter-to-heavier density of media from front to back stops surface loading, dust and dirt builds up from the inside out. To you, this means Glasfloss catches more dust and dirt, doesn't hamper the flow of cooled or heated air, lowers maintenance costs. Write for complete information on Glasfloss Filters now, ask for Bulletin DF3. Address your request to Glasfloss Dept., Fiber Glass Division, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pennsylvania.

Over 800 tons of refrigeration supply cold water to 20 individual unit conditioners. All fresh and re-circulated air is filtered by Glasfloss in these units at the total rate of 320,000 cfm.

GLASFLOSS IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

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a function of the drop-out ot the line contactor by inserting an auxiliary switch of the line contactor in the sealing circuit of the master relay.

With this arrangement, standard momentary start and momentary stop pushbutton elements are used. If the controller should drop out on power failures, motor must be restarted manually. This type of control circuit is recommended where extensive system studies have not been made.

High voltage air-break contactors which are designed to drop out at a selected low voltage value provide for fewer outages of important motors during momentary disturbances. By connecting an adjustable resistor in series with the discharge rectifier section, an adjustable delayed opening time from about one-tenth to one-half second can be selected. Longer delays are possible, but a delay of one-half second is considered sufficient for the clearing of system faults.

Time-delay opening can enable motors to ride through disturbances without being disconnected from the system or, if disconnected, to attain lower residual voltages so that they can be more safely and quickly reconnected to the system.

These advantages involve small additional cost and contribute reliability and over-all performance of an industrial plant, chemical plant or refinery power distribution system.

The employing of time-delay undervoltage restarting and the use of contactors having controlled drop-out characteristics should be considered only after a complete system analysis has been made.

BIG in Capacity

HIGH in Filter Efficiency

SMALL in Micro-Inch Particle Size

Delpark Filter-Matic

TUBULAR SCREEN VACUUM FILTER

The response to DELPARK'S FILTER-MATIC vacuum filter has been tremendous. The reasons for such interest is obvious. The DELPARK FILTER-MATIC occupies a minimum of floor space, yet it handles an extremely high rate of flow. With these features, DELPARK engineering has achieved such a high degree of filtration that low micro-inch production finishes are easy to attain.

Permanent filter media used in the DELPARK FILTER-MATIC may be used without filter-aid. Where absolute filtration is required, precoat may be used as needed. Capacities 5-1000 g.p.m.

Write giving complete details for more information on DELPARK FILTER-MATICS *as applied to your filtration problems.*

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INDUSTRIAL FILTRATION COMPANY
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LEBANON, INDIANA

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Plant Changeover?

(Continued from page 141)

be supported over the area of the pad. For most of our machines, like the ¼-in. solid die header in Fig. 2, the neoprene pad was simply cut to the size of the machine footing, with about a ¼-in. extra on each edge to bed the footing into the pad. For some of the heavier machines like the ½-in. solid die header in Fig. 3, steel shim plates were placed under machine footings which were too small to provide a sufficient mounting area. Each shim plate was cut to a size required for proper area loading of the pad, bolted to the machine foot, and the machine lowered onto the pad. Occasionally an adhesive was applied between the plate and pad. For example, the footings of our heaviest machines, weighing 15 tons, were fitted to shim plates 18 by 18 in. in size, corresponding to the area of the standard pad that was used in each case. The area loading on the pads for these machines were thus about 23 psi.

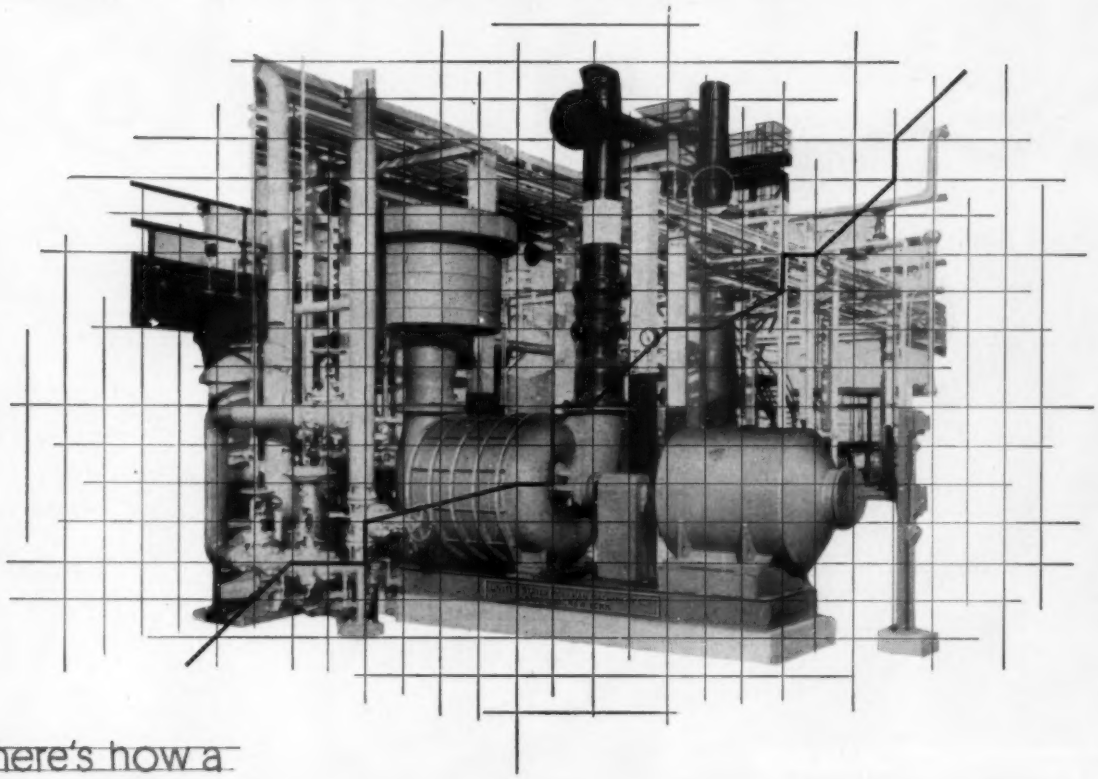
Because the pads are comparatively inexpensive, we use more pad area than might be necessary under ideal floor conditions. We have found that the oversized pad area has always insured successful results under these conditions without special shimming, cementing or remachining of the legs.

The use of pads throughout our plant has given us, as we planned it should, many advantages that parallel the drawbacks of the anchoring method:

1. The machines can be easily relocated when it is advantageous to change the production layout.
2. The cost of expansion has been lower because the time involved in preparing for installation of machines has been reduced.
3. The mounting pads require literally no maintenance. The grease and grime that inevitably collects at machine footings has in no way affected the neoprene pad material.
4. Shop noise and floor vibration is very much lower. Of course, our employees are equally pleased at the result.

In addition, we have been able to save shut-down time when machines are taken off the line for repairing and

Hoffman engineered systems get **results:**



here's how a

HOFFMAN MULTISTAGE CENTRIFUGAL BLOWER

helps recover valuable sulphur from refinery gas!

The by-product sulphur recovery system of a leading West Coast refinery required an unfailing, 24-hour-a-day source of process air.

Hoffman engineers, in conjunction with the refinery's consultants and engineering personnel, developed an unusual design to serve as the "heart" of the process.

A Hoffman multistage, centrifugal blower was direct-connected to dual drives with a steam turbine on one end and a 150 h.p. electric motor on the other. In the event of power or steam failure, the load can be automatically transferred from the motor to the turbine. The out-of-doors, all-weather installation thus functions continuously, dependably.

Here is yet another example of how Hoffman air appliance engineers work in conjunction with plant engineers, to design a "custom" installation. Find out how Hoffman engineered systems can get results for **you!** Write for free bulletin M-133.

AIR APPLIANCE DIVISION U. S. HOFFMAN MACHINERY CORPORATION DEPT. P.E., 103 FOURTH AVE., NEW YORK 3, N.Y.

AIR APPLIANCE DIVISION Multistage Centrifugal Blowers and Exhausters. Pneumatic Conveying Equipment. Industrial Vacuum Cleaning—Portable and Stationary Systems. Continuous Metal Strip Driers. "Smoothflow" Fittings and Tubing. INDUSTRIAL FILTRATION DIVISION Machine Tool Coolant Clarifiers—Flotation, Mechanical, and Magnetic. Lubricating and Insulating Oil Conditioners, Filters, and Vaporizers. Solvent Recovery Systems—Vacuum Stills and Filters. ORDNANCE EQUIPMENT DIVISION Special Pneumatic Conveying Systems, High Efficiency Centrifugal Separators. Stationary and Portable Vacuum Cleaning Equipment. Process Equipment. Pneumatic Systems for Radioactive Materials.

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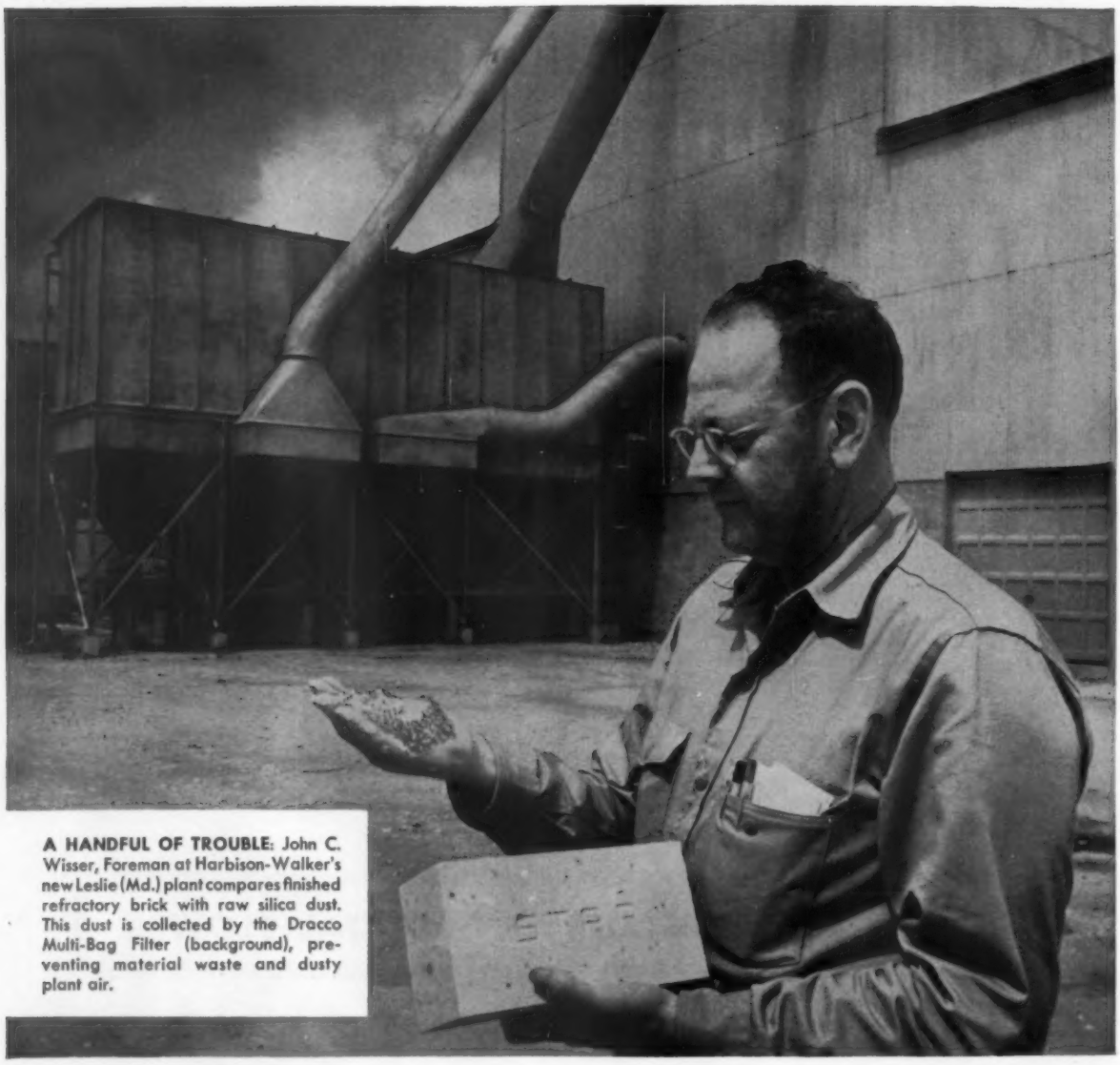

A HANDFUL OF TROUBLE: John C. Wisser, Foreman at Harbison-Walker's new Leslie (Md.) plant compares finished refractory brick with raw silica dust. This dust is collected by the Dracco Multi-Bag Filter (background), preventing material waste and dusty plant air.

Dracco dust control keeps new plants new

There's something exciting about a new plant. It symbolizes the success and progress of your company.

Uncontrolled dust can spoil the picture before you know it: maintenance and cleaning costs rise—machines become worn—efficiency is affected by dirty plant air—valuable material is wasted.

The time to solve dust problems is before the plant is built. Dracco engineers working hand-in-hand with your plant engineering staff can plan a dust control system which will prevent dust from polluting plant air or the atmosphere and keep employees and machinery working like new.

Harbison-Walker Refractories Company is typical of forward-thinking companies who pre-plan for production efficiency. Their new ultra-modern plant in Leslie, Maryland, uses Dracco Dust Control to prevent spread of dust from grinders and belt conveyors.

If your company is planning a new plant, or an expansion of your existing facilities, it will pay to look ahead with Dracco.

DRACCO CORPORATION
4035 East 116th Street • Cleveland 5, Ohio

Bulletin 800 is Dracco's 40-page catalog on dust control and recovery. Contains detailed facts and figures on all dust control equipment. For your copy, write Dracco today.

DRACCO *airstream* conveyors
dust control equipment

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remodeling in our maintenance department. Since moving into the new plant, we have lifted more than 20 machines off the floor, moved them to maintenance, and placed them back in the same position without touching the pads supporting them.

Fluid Power Maintenance

(Continued from page 137)

and different types of systems, so it would be difficult to recommend how often a filter should be serviced. The maintenance personnel should be able to judge this by the condensation and the foreign matter in their pipe lines. One thing that must be remembered is that the condensation must be drained from the filters or they will fill up and become inoperative. It is often necessary to drain them once a day. Some filters are equipped with automatic drains which reduces the amount of maintenance required.

Maintenance of filters which make use of a filter element, see Fig. 3, is rather simple. These elements are made of a synthetic material composed of phenolic-impregnated cellulose, sintered metal (usully bronze) or metal screen porous stone and are easily disassembled from the unit. Those made of phenolic-impregnated cellulose may have a filtering action that will stop particles as small as one-half micron.

Elements of the above type can usually be cleaned by backwashing

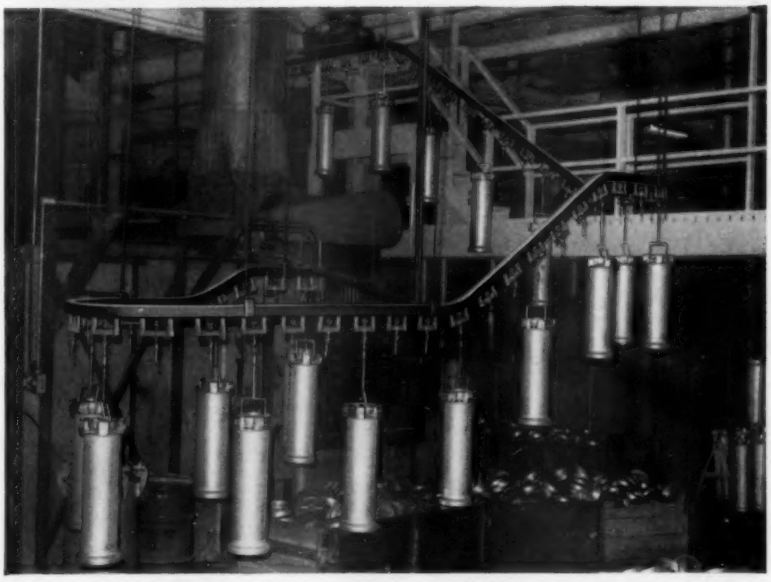
"I'm making out our accident report, Benson . . . Hurry it up."

with a good solvent. Replacement elements are usually relatively inexpensive and should be used if the solvent will not completely clean the used element. Not much can go wrong with this type of filter, since there are no moving parts. Occasionally a gasket might fail, but this is very remote.

When servicing a mechanical type filter, ordinarily it is only necessary to remove the sediment from the in-

. . . for a new plant going into production

or the expansion of present production lines



R-W "Zig-Zag"® CONTINUOUS POWER CONVEYORS

provide maximum efficiency and economy

R-W "ZIG-ZAG" Conveyors effectively meet the demands of today's highly competitive market by efficiently utilizing valuable overhead space to provide a continuous flow of materials for maximum production. R-W "ZIG-ZAG" Conveyors are extremely flexible . . . easily move up, down, in, out and around . . . carry unit loads up to 125 lbs. at speeds from one inch to 100 feet per minute. R-W "ZIG-ZAG" Conveyor systems may be quickly and easily altered, expanded or relocated by plant personnel. "ZIG-ZAG" Conveyors are designed, manufactured and backed by the leading firm in this field for over 75 years . . . Richards-Wilcox.

"Zig-Zag"® QUALITY FEATURES

- **SAFE** . . . all moving parts of the chain are fully enclosed and protected from lint, dirt and dust.
- **STRONG** . . . a continuous chain of alternate horizontal and vertical wheel units travel through a rugged steel track.
- **FLEXIBLE** . . . easily installed in any plant. Easily changed or relocated to meet any plant alterations or requirements.
- **ECONOMICAL** to purchase, install and operate.
- **SPACE SAVING** . . . available with standard horizontal or vertical curves . . . two foot radius (others available).

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Leading manufacturer of Track, Hangers, all types of hardware and Electric Door Operators for over 75 years.

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LOW COST DIFFERENCE BETWEEN

SLIPPING FEAR

SAFETY

Pattern actual size

Eliminate slipping fear and increase efficiency by installing A.W. Super-Diamond—the low cost safety floor plate that takes the danger out of hazardous slipping areas.

Stops skids and slips *with*	Raised steel figures *diamond-shaped for maximum slip-skid resistance from all approach angles*
Get maximum wear *with*	Tough rolled steel floor plate
Easily fabricated *with*	Ordinary shop equipment
No matching problems *with*	Non-directional pattern—minimum waste
Cleans, drains rapidly *with*	No maintenance problems
Solve your slipping problem *with*	A.W. Super-Diamond as independent flooring, as an overlay—or used structurally.

For complete information write on company letterhead to Dept. **SD-S9.**
No other floor plate can match A.W. Super-Diamond's safety and durability at so low a cost.

Wherever oil, grease, or other substances raise special slipping accident hazards, we suggest a check on the special non-slip qualities of A.W. ALGRIP—the world's only abrasive rolled steel safety floor plate.

A.W. SUPER-DIAMOND
ROLLED STEEL FLOOR PLATE

ALAN WOOD STEEL COMPANY • CONSHOHOCKEN, PA.

Other Products: A.W. ALGRIP Abrasive Rolled Steel Floor Plate—Plates—Hot and Cold Rolled Sheet and Strip—(Alloy and Special Grades)

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terior. If the bearings are damaged, a complete overhaul may be required. Filters should always be placed where they are readily accessible.

Lubricators, Fig. 4, as stated in Part VIII, along with filters, play an important part in the pneumatic system. Lubricators do not require much maintenance except that they must be filled regularly with lubricant. It is not uncommon to walk through a plant and see the majority of lubricators void of oil.

Lubricators should not put too much oil into the air stream, as it will cause a messy condition when the air is exhausted from control valves. Lubricators have controls for measuring the amount of oil that is expelled into the air, and the machine operators should be cautioned about changing the setting of these controls. The amount of oil distributed is controlled, in most instances, by the setting of a needle valve.

What could cause a lubricator to malfunction? Since there are several types of lubricators, it would be difficult to find all of the reasons, but in general:

1. Oil not being distributed when there is plenty in the lubricator can be caused by several things. If there is excessive vibration of the machine, it is possible that the needle valve may have jarred to the closed position—resulting in the stoppage of the oil. If there is any dirt present, it may clog the small tubes, checks and needle valve, causing a stoppage. Always make certain that clean oil is used when filling the lubricator. Check for lint and any other minute particles that might cause trouble.

2. Too much oil being distributed is usually caused by two things. First the adjusting needle may be incorrectly set for the amount of air that is passing through the lubricator. Second, the point of the needle or the needle seat has become worn so that fine control is no longer possible, and it is time to make replacements.

3. Leaky seals and checks are an occasional source of trouble and should be checked and repaired.

Lubricators having plastic bowls should be protected from possible damage by plant vehicles. It is imperative that they be placed so they are easily accessible and in plain view so the maintenance man can tell when they need refilling.

Always use a good grade of oil in the lubricator. Many recommend a light spindle oil. Some lubricators are designed so that they can be filled without the air being turned off; while on others, the air must be shut off. Be sure to read the printed instructions on each type. On drip-type lubricators that do not have an automatic shutoff, be sure that they are shut off each night and then turned back on in the morning. Otherwise, all the lubricant is liable to end up in the pipe lines during the night and, when the control valve is shifted the next morning, there will be a stream of oil shooting out of the exhaust of the valve.

New Plant Construction

(Continued from page 156)

house, machine shop and a steam generating plant. Plant, with equipment, reported to cost in excess of $5 million.

Oklahoma City, Okla.—Western Electric Co., 195 Broadway, New York, N. Y., plans to construct a new plant for the production of automatic switching equipment for the telephone industry. Plant will have a floor area of 1,200,000 sq ft and will include a three-story administration building, a single-story manufacturing building and a separate service building. Cost reported to be about $35 million.

Lester, Pa.—Westinghouse Electric Corp., Pittsburgh, Pa., has authorized a multi-million dollar program to streamline and substantially increase production capacity of its small turbine department. Manufacturing

Illustrated—Logan Model 400 RFL Unit

Look to Logan

the ultimate in air circuit accessories

Logan RFL Unit, the designers choice for over a decade! Protects your air-powered equipment . . . regulates pressure . . . filters air . . . lubricates air. Adds years of dependable performance.

New Model 400, illustrated above, is a companion model to the well-known Model 600.

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space will be nearly doubled by late fall of 1959 when company hopes to have project completed. New machine tools will be installed and the whole manufacturing flow revised and modernized.

Trafford, Pa.—Westinghouse Electric Corp., Pittsburgh, Pa., plans to construct a new plant here for the manufacture of switchgear apparatus. New facility when completed in 1960 will be occupied by the power circuit breaker department. Cost of project is expected to represent a multi-million dollar investment.

Bristol, Tenn.—Sperry-Rand Corp., 30 Rockefeller Plaza, New York, N. Y., plans to construct a new plant for the production of units for naval ordnance systems, air navigation equipment and missile system equipment. Plant will be a modern one-story structure with a floor area of 150,000 sq ft and will be completely air-conditioned. Work is expected to proceed at once for completion in late 1958. Estimate of cost reported to be approximately $2 million.

Erwin, Tenn.—W. R. Grace & Co., 7 Hanover Square, New York, N. Y., plans to construct a new plant for the production of basic raw materials for nuclear reactor fuel. New facility will be operated by company's Davison Division when completed late in 1958.

Dallas, Texas—Braniff International Airlines plans to construct a large maintenance and operations base near here. Company plans to convert six acres of a 36-acre tract of land into a three-story main building, overlooking Love Field. New structure will house more than six planes of the DC-7 type and will represent an investment of $6.5 million when completed in the spring of 1958.

Houston, Texas—Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland, O., has authorized plans for construction of new plant for production of vinyl chloride monomer at Deer Park, near here. New facility will be designed and engineered by Scientific Design Co., New York, N. Y., and constructed by Brown & Root, Inc., Houston, Tex., for completion by late 1958.

Odessa, Texas—El Paso Natural Gas Products Co., subsidiary of El Paso Natural Gas Co., El Paso, Texas, plans to construct a 6,500 bbl per day refinery and new alkylation unit at local site here. No estimate of cost announced but it is reported to be a multi-million dollar investment.

Port Arthur, Texas—Atlantic Refining Co., 260 So. Broad St., Philadelphia, Pa., plans to construct a new alkylation unit at its local refinery here. New facility will produce about 2100 bbl daily of a high octane component for company's gasoline production. Construction will begin at once for completion by early spring of 1958. Cost reported to be about $2 million.

Nitro, W. Va.—Monsanto Chemical Co., Organic Division, St. Louis, Mo., plans to construct a new tall oil distillation plant here. Company has let contract calling for the complete design, engineering, drafting, procurement and supervision of new facility to the Badger Manufacturing Co., Cambridge, Mass. New plant will be scheduled for production by spring of 1958.

South Charleston, W. Va.—Food Machinery & Chemical Corp., San Jose, Calif., has authorized a multi-million dollar expansion program involving carbon bisulfide and carbon tetrachloride producing facilities at company's largest chemical installation, Westvaco Chlor-Alkali plant, located here. Rehabilitation program is scheduled for completion by the summer of 1958.

Rock Springs, Wyo.—Intermountain Chemical Co., controlled by Food Machinery and Chemical Corp. and National Distillers Products Corp., has announced plans for expansion at local plant. Company will increase production of soda ash from 350,000 tons a year to 500,000 tons a year by early 1958. Expansion is reported to represent a multi-million dollar investment.

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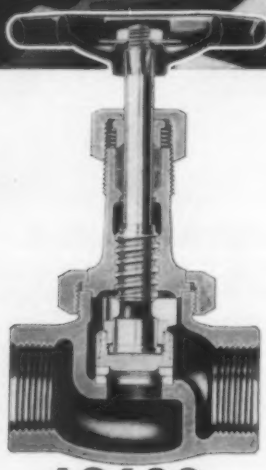

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BULLETINS

(Begins on page 21)

INSTRUMENTS, CONTROLS

158 Basic Controls — More than 34 basic types of industrial temperature and pressure controls are included in this 96-pp industrial catalog. Covers self-operating regulators, water mixing equipment, pneumatic control instruments, indicating and recording instruments, control valves and pneumatic motors. Equipment described is designed for industrial process control, as well as for heating, ventilating, and air conditioning systems, and hot water service applications. Powers Regulator Co.

159 Pneumatic Control—Complete information on the Speedomax G pneumatic control for steel, chemical, petroleum and allied industries is presented in 12-pp Folder ND4(9). Included are line drawings illustrating pertinent details and a block diagram showing how pneumatic system works. Leeds & Northrup Co.

160 Gas Regulators—Catalog 806, 40 pp, covers pressure regulators for industrial compressed gases. It deals with various types of cylinder, manifold, and pipeline regulators, both single- and two-stage, and a variety of specialized equipment such as laboratory and metering regulators and gas proportioners. Flow and pressure charts in graph form give data on performance. In addition, related equipment—such as valves, adapters, hose connections, and pressure gages—is illustrated. Air Reduction Sales Co., Div. of Air Reduction Co., Inc.

161 Gas Regulation—Revised, 8-pp Bulletin 1024-6, on high pressure gas regulators, features a new regulator designed to withstand momentary overloads up to 1000 psi on the outlet side. Other regulators are also presented, along with dimensional and capacity data, design features and application suggestions. Meter and Valve Div., Rockwell Mfg. Co.

162 Meter Selection—Bulletin 566, 28 pp, has been revised to aid in selecting the best meter-register combination for any industrial liquid metering job that can be handled with company's standard line of meters. Arranged in comparative chart form, subjects covered include: how meters save; list of liquids that can be handled; construction details; register types; and sizes of meters. Accessories, installation directions and application photos are included. Neptune Meter Co.

163 Automatic Controls—Automatic package controls, for virtually any industrial application where a chemical or mechanical function can be measured electrically, are described in 16-pp Catalog AC-2. These include control of temperature, torque, viscosity, current, voltage, timing of welding, conveyor overload, speed, plating, battery charging, radiation, moisture content, pressure, others. Tipptronic, Inc.

164 Temperature Controls—Bulletin F 2287-4 discusses the applications of company's Electrionic temperature controls for heating, ventilating and air conditioning field. Explains features, functions and advantages, and illustrates components and accessories used in various types of Electrionic systems, as well as specific applications of each. Barber-Colman Co.

165 Numerical Positioning Control—Bulletin GET-2675, 14 pp, describes functions of numerical positioning control, gives a detailed breakdown of the three major elements—data input, director, and servo drive—and lists features. Each operation is graphically illustrated. General Electric Co.

166 Contact Meter-Relays—Contact meter-relays, versatile instruments that both indicate and control almost any physical or chemical condition that can be detected electrically, are described in 40-pp Catalog 4-C. Supplies complete information for ordering and discusses various circuits for providing different types of control action. The catalog contains complete specifications for the various models and is illustrated with photos and circuit diagrams. Assembly Products, Inc.

167 Air and Hydraulic Devices—The revised edition of "The Facts of Life" on air and hydraulic devices offers 18 pp of information on maintenance and installation of air and hydraulic equipment. Gives the do's and don'ts of making an installation and tells what to look for in failures. Logansport Machine Co., Inc.

169 D-C Crane Control—Bulletin GEA-6434, 8 pp. features precision hoist, bridge, and trolley control systems. Provides product descriptions, typical speed-load curves of d-c hoist control, information on special crane controls, and features of components for d-c crane controls. General Electric Co.

170 Multi-Channel Oscilloscopes — Standard two- and four-channel oscilloscopes, strainalyzers and related d-c amplifiers are described in this 28-pp catalog. A portion of it is devoted to explaining advantages of multi-channel oscillography in which non-recurring events may be triggered and resulting operational phenomena recorded simultaneously from different points. Catalog also lists many standard multi-gun cathode ray tubes. Electronic Tube Corp.

171 How Dense the Smoke? Bulletin 08113 describes an optical instrument—the M-S-A Smokescope—designed for accurate estimations of smoke density in stack effluent. Advantages of the instrument are fully detailed, as well as operation features. Mine Safety Appliances Co.

LIGHTING

172 Fluorescent Lighting—This price catalog, Schedule U219-A, about 52 pp, covers commercial, industrial and recessed fluorescent lighting equipment. Profusely illustrated with photos, drawings and diagrams, it contains complete selection data on commercial fixtures, commercial stem sets and hangers, aluminum troffers, as well as on industrial fixtures, economy sets, accessories. Smithcraft Lighting.

173 Tips on Ballast Heating — Bulletin GED-3328, 8 pp, points out basic heat problems and objectively describes what causes overheating in fluorescent lamp ballasts. Tells what happens to an overheated ballast and gives steps to avoid ballast overheating and associated problems. General Electric Co.

174 Mercury-Lamp Transformers — Bulletin GEC-1440 gives application, price and dimension data, wiring diagrams, superseded as well as new catalog and model numbers, on company's mercury-lamp transformers and reactors for 120- through 480-v operation, 60 cycles, high and low power factor, in a variety of construction types. General Electric Co.

ELECTRICAL

175 Weather-Protected Motor — Features which contribute to outdoor dependability of these weather-protected motors are described in 6-pp Bulletin 51B8606A. Construction features are illustrated and a diagram showing flow of ventilation air is included, as well as motor ratings chart. Allis-Chalmers Mfg. Co.

176 Totally-Enclosed Motors—Bulletin 500-A describes company's totally-enclosed, fan-cooled motors in ratings from ½ to 40 hp. Ratings and dimensions are listed on tables. Robbins & Myers, Inc.

177 Specialty Transformers—Bulletin GEC-1431 describes dry-type specialty transformers for general light and power service. Gives application, price, new dimension and model number data, and wiring diagrams on dry-type specialty transformers 600 v and below, 60 cycles, commonly used to reduce voltage of 240-v, 480-v, or 600-v distribution circuits to supply 120- or 240-v loads. General Electric Co.

178 Transformer Maintenance Hints—Fifty-pp, pocket-size Booklet B-4716-B provides "timely tips on transformer maintenance." Discusses transformers and their maintenance and includes such subjects as general inspection procedures, classification of transformers, methods of drying out, and transformer connections. Text is concise and illustrated with photos, diagrams. Westinghouse Electric Corp.

179 Core-Coil Replacement — Ease with which company's transformer core and coil assemblies can be used for replacement purposes is told in Bulletin 61B6345B. They are available in 3 kva through 25 kva and in high voltage ratings 2.4 kv through 15 kv. Bulletin also includes mechanical information on the replacement assemblies. Allis-Chalmers Mfg. Co.

181 On Magne-Blast Breakers — Bulletin GED 3337, 6 pp, describes operation and application of new stored energy closing mechanism for magne-blast circuit breakers rated 150 mva or higher. Includes exploded schematic drawing of stored energy feature, photos of equipment, and diagram of typical system employing metal-clad switchgear with stored energy. General Electric Co.

182 Electrical Specialties—Switches, industrial sockets and portable lamp guards are described in the 32-pp "Handy Book of Electrical Specialties." Includes detailed descriptions and illustrations of all equipment, specifications and performance data. McGill Mfg. Co., Inc.

183 Plug-In Busway—This illustrated bulletin describes advantages of the plug-in Uni-Bus feeder designed for flexibility, economy and safety in power distribution. A typical specification is detailed. Electric Distribution Products, Inc.

184 Electrical Connections—Low cost, low resistance formed electrical connections are described in this 6-pp bulletin. A method of eliminating terminal lug difficulties is presented. Complete engineering information is given including operational methods for forming the connections and data on the new tool required. United States Research Corp.

185 Time Delay Relay—Bulletin SD-1 features a selection chart for choosing the correct Agastat time delay relay for a variety of operations. Mountings and enclosures are also diagrammed. AGA Div., Elastic Stop Nut Corp. of America.

186 Current-Limiting Fuses—Bulletin GEA-6319B, 8 pp, describes CLF current-limiting fuses capable of interrupting short circuit currents up to 200,000 RMS symmetrical amperes. Publication describes operation and typical application of the fuses, includes dimensions and ratings, and illustrates current characteristics. General Electric Co.

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METALS, METAL PRODUCTS

187 Aluminized Steel Products — Bulletin P. O. 5656 tells how to get long service life at low cost with Aluminized steel (aluminum-coated) building products. Among these are roof deck, roofing, siding, rolling doors, roof ventilators for steel buildings. Such advantages as corrosion resistance, strength, heat reflectivity detailed. Armco Steel Corp.

188 Corrosion-Resistant Material — Zirconium's corrosion resistant properties receive authoritative treatment in the corrosion issue of "More Zr Facts"—an 8-pp brochure published by the company. Brochure includes discussion of uses of zirconium's corrosion resistant properties in various types of atomic reactors and in chemical processing. The Carborundum Metals Co., Div., The Carborundum Co.

190 Stainless Steel Bar, Wire — Bulletin P.O. 4756 is a 24-pp guide to stainless steel bar and wire. Describes 45 types of stainless steel available in these forms, including several special proprietary grades. Advantages, properties, fabrication, electropolishing, ebonizing, and supply information are also included. The booklet is fully illustrated with photos of typical applications. Armco Steel Corp.

METAL WORKING

192 Machining Stainless — This pocket-size slide chart contains latest information on how to machine the popular grades of stainless. One side gives data on turning, drilling, tapping, threading, milling and reaming operations. It tabulates speeds and feeds, and gives special notes on drilling, tapping, lubrication and welding. The other side shows relative workability of stainless steels in a wide variety of operations. The Carpenter Steel Co.

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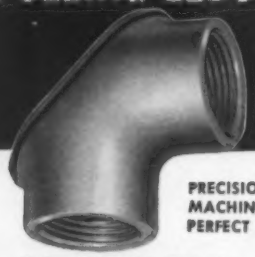

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BULLETINS

(Begins on page 21)

193 **Metal Working Machinery** — Profusely illustrated Catalog 26, 68 pp, describes a variety of shop equipment and supplies. Subjects covered include equipment for bending, grinding, punching, shearing, sawing, welding, forging, drilling, tapping, threading, notching, materials handling and others. Describes products of many manufacturers, including company's bar twisting machine, a line of punching and angle shearing machines, and a power driven hydraulic press. Julius Blum & Co., Inc.

194 **On Hammer Maintenance**—Bulletin 364 is a 38-pp service manual on maintenance of steam drop forging hammers. Details, in text and drawings, hammer installation and preventive maintenance necessary for efficient use of steam drop hammers in forging shops. Also suggests means and methods for minor repairs. Erie Foundry Co.

OTHER EQUIPMENT

195 **Roofing and Siding Data**—This folder contains Bulletins 2032, 2032A, B, C and D on corrugated Asbestone roofing and siding, stud weld fasteners, Topseal, Holegrip and side-lap fasteners, staggered joint application and straight joint application. Includes specifications, as well as photos and dimensional drawings showing construction and application details. National Gypsum Co.

196 **Teflon Applications**—This 20-pp engineering handbook covers Teflon and its practical applications as a cushioning and insulating material for supporting clamps. Contains data on chemical, thermal, electrical and aging properties, and describes handling methods. A chart covers 28 tests of the various physical properties. TA Mfg. Corp.

Among this Month's New Literature of Merit . . .

197 **Gaskets, Packings**—This 48-pp catalog contains a wealth of information on industrial gaskets, mechanical packings, boiler gaskets, packing hooks, steel rule dies. Also outlined are manufacturer's facilities for contract die cutting and fabricating of non-metallic materials. An engineering section includes a gasket recommendation chart, mechanical formulas and decimal equivalent table. Rhopac, Inc.

198 **Remote Control Switches** — Engineering data and descriptive detail on company's line of remote control switches are featured in 80-pp Catalog 57-S2. Fully illustrated with photos, drawings and diagrams, the catalog describes operation and construction features, methods of control, and presents complete technical information on the remote control switches, which are used for convenient and accessible control of power, lighting circuits from any number of stations. Available to qualified plant engineers. Automatic Switch Co.

199 **Tape Recorders in Industry**—How tape recorders can save time and money in more than 70 applications is explained in this 42-pp booklet. Tells how tape recorders are used in management communications, methods and procedures in factories, and in personnel, sales, advertising and public relations departments. Also includes table listing reel size and playing time of each of the six tapes available. Minnesota Mining and Mfg. Co.

200 **Industrial Equipment**—This 24-pp illustrated handbook contains detailed specifications and complete descriptive data on a full line of office and plant equipment, including such items as shelf trucks, lockers, small parts cabinets, hand dryers, fireproof blueprint cabinets and glass door display cases. General Industrial Co.

201 **Descaling Equipment** — Catalog D57C, 36 pp, illustrates and describes operating principles and features of the Hydra-Jet descaler equipment for removal of scal from bars,

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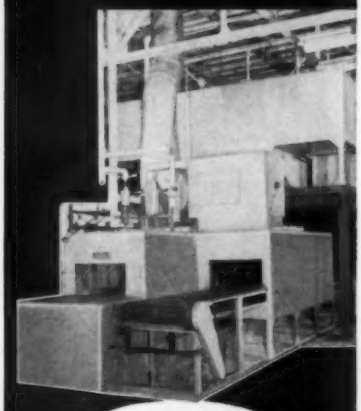

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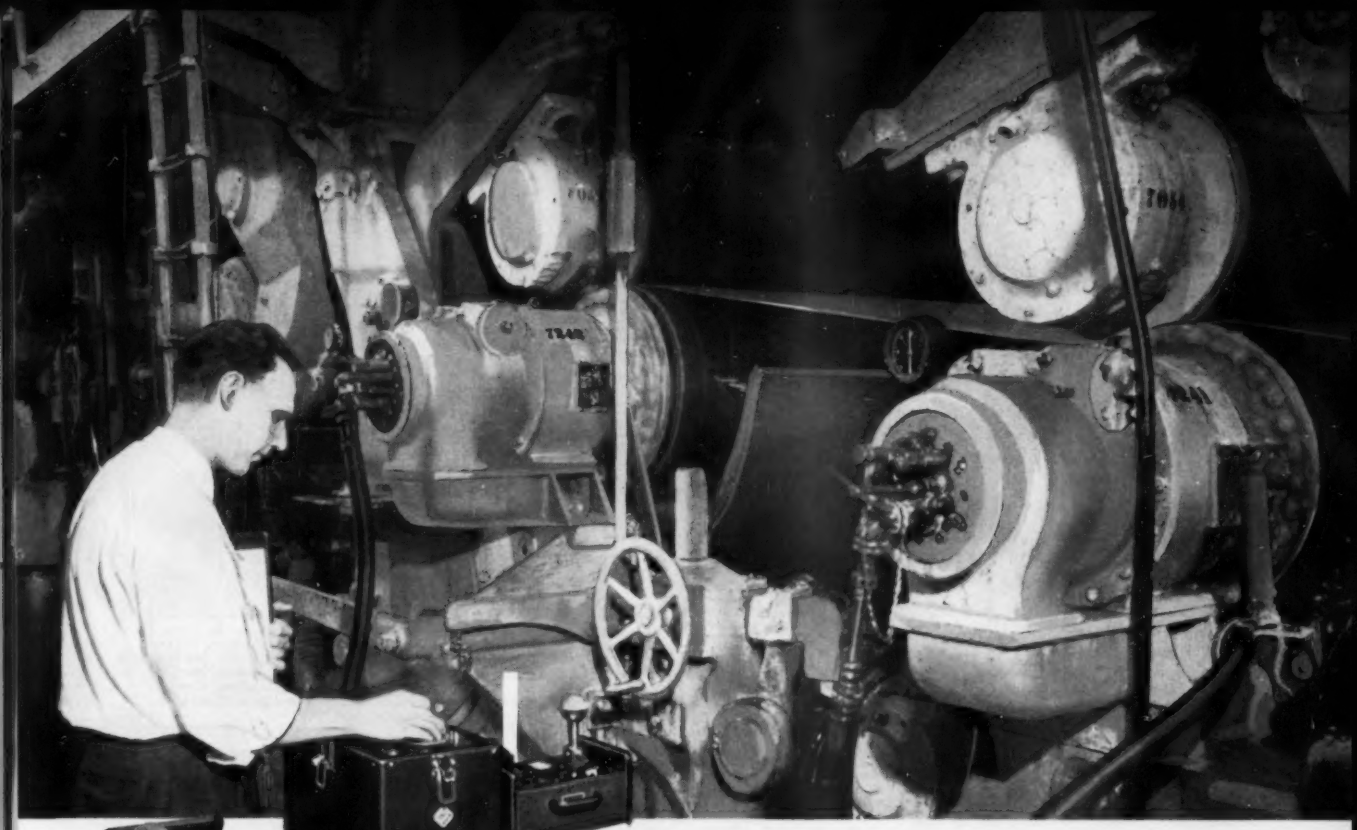

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BULLETINS

(Begins on page 21)

slugs, rolled mill products prior to hot working. Explains such features as attainment of high pressure by an oil pump rather than high-pressure, water pump, use of a jet ring or jet bar to produce a continuous sheet of high pressure water. Specifications for standard models and components and arrangements used in individually-engineered systems are included. The Commercial Shearing and Stamping Co.

202 **Impervious Graphite**—Recommendations for application of Karbate impervious graphite and National resin base cements in corrosive service are presented in Catalog Section S-5050. Includes explanation of what Karbate is and how it is made, describes resin base cements used in fabrication of Karbate equipment, and features a table recommending grade of impervious graphite and resin base cement to be used in various applications. National Carbon Co., Union Carbide and Carbon Corp.

203 **Evaluating Steam Purity** — Technical Paper 135, 8 pp, entitled "Conductivity Vs Sodium by Flame Spectrophotometer In Steam-Purity Studies," presents results of laboratory and plant work to indicate that sodium is extremely valuable in evaluating steam purity. Performance curves and a table of saturated steam samples given. Betz Laboratories, Inc.

204 **Centrifugal Collectors** — Two design types of centrifugal collectors are described in this 6-pp bulletin, which explains industrial applications for each in efficient air cleaning and dust collection through centrifugal force. Complete specifications are included, as well as dimensional drawings and information on collector selection through determination of particle size, etc. The Kirk & Blum Mfg. Co.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided for you on pages 269-270.

ELECTRICAL

301 **Motor Buying Tips**—Bulletins GEC-1026A and GEC 1027A, each 11 pp, give buying information on a selected group of this manufacturer's motors. Included are application data, ratings and prices for fractional horsepower motors, integral-horsepower polyphase and single phase induction motors, motors and control for part winding starting, gear-motors and resilient-base integral-horsepower induction motors. General Electric Co.

302 **Variable Speed Motors**—Sixteen-pp Bulletin 1797, revised, outlines many reasons why variable speed motors can be used to improve production, and it includes illustrations of all types of company's Varidrive motors, as well as their mechanical features, remote controls; etc. U. S. Electrical Motors, Inc.

303 **Motors and Transformers**—This 8-pp bulletin contains detailed information on company's electric motors and dry-type transformers. Rating and dimension data are presented in convenient tabulated form, and illustrative detail, including photos and mounting diagrams, is included. Wagner Electric Corp.

304 **Commutator Slip Ring Maintenance**—This practical little 40-pp handbook gives procedures and methods for commutator and slip ring maintenance. Generously illustrated with photos and sketches, booklet contains sections devoted to common troubles and their corrections; brushes; general maintenance; and company's products for maintenance of commutators and slip rings. Defines commutator terminology. Ideal Industries, Inc.

305 **Motor Controls**—In the 86-pp Controlog are cataloged a variety of motor controls including starters, control centers, contactors, relays, switches, and accessories. Fully illustrated with photos and dimensional drawings, gives applications and descriptive information on each class, and includes prices and ordering data. General engineering data included. The Clark Controller Co.

307 **Motor Speed Controls**—Eight-pp Form 927A features motor speed controls for adjustable-speed operation of d-c motors from a-c lines. Applications and advantages are listed, operating principle is detailed, and specification, price data included. General Radio Co.

308 **Electrical Equipment Digest**—Electrical equipment illustrated and described in 138-pp Catalog Digest 139, includes load centers, circuit breakers, low voltage control, fusible service equipment, interchangeable hubs, meter equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters, magnetic breaks, relays, contractors and many other types of equipment. Complete engineering data given. Square D Co.

309 **What You Should Know About Circuit Breakers**—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, in-rush current effects, tripping and reset time. Heinemann Electric Co.

310 **Enclosed Switches**—Catalog 83, 28 pp, describes in detail enclosed switches for industrial applications. Included are general switches designed for use on either a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches, all of which are available in a variety of actuator designs, contact arrangements and electrical ratings. Photos, dimensional drawings, circuit diagrams, electrical data are included. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

311 **Low Voltage Switchgear**—Twelve-pp Bulletin 6004B presents low voltage switchgear of the metal-enclosed, drawout type for indoor and outdoor installation using Types K and LG air circuit breakers. Design and construction details are exlained and illustrated and emphasis is placed on safety advantages afforded by test position with door closed. General specifications and standard frame arrangements given. I-T-E Circuit Breaker Co.

312 **Time Delay Relay**—Bulletin SR3 describes a time delay relay, consisting of a pneumatic timing head, a solenoid assembly, a switch and terminals. Contact and terminal arrangements are diagrammed and complete specifications included. AGA Div., Elastic Stop Nut Corp. of America.

313 **Panel Components**—Bulletin EE-120 is a 54-pp panel builders handbook of electrical components, containing specifications, diagrams, dimensions, photos and price lists of company's motor control. Profusely illustrated with photos, dimensional and wiring diagrams, bulletin covers manual starters, relays and contactors, magnetic starters in non-reversing, reversing, and multi-speed types, and a group of accessories which include thermal overload relays, oil tight pushbutton units, limit switches, timing devices, solenoids, electrical interlocks, and solenoid-operated brakes. Cutler-Hammer, Inc.

314 **Aluminum Conduit Fittings**—To fulfill the need for electrical equipment made of materials which resist corrosive attack of many chemicals destructive to ferrous or standard aluminum equipment, Bulletin 2681 presents a broad selection of Condulets and related equipment utilizing copper-free aluminum alloy in their construction. It includes Condulets, lighting fixtures, plugs and receptacles and others for both hazardous and non-hazardous locations. Book provides a pictorial-descriptive index plus full catalog listings, prices. Crouse-Hinds Co.

315 **Electrical Wires, Cable**—Bulletin 1105, Section 1, 16 pp, features a cable selection chart and complete engineering information on company's line of electrical wire and cable. Advantages of the products are detailed, a table of insulations furnished, and design and construction features illustrated. The Okonite Co.

316 **Cathodic Protection Cable**—Two kinds of cathodic protection cables are described in this informative bulletin. Special advantages of each are listed, and applications and specifications are given. General Cable Corp.

317 **Wires and Cables** — Interlocked armored cable, supports and fittings designed for low cost, heavy duty industrial, power or control wiring are described in this 24-pp bulletin. Photos and specific descriptions of various types of armored cables available for voltages through 15,000 v, single and multi-conductor are included. Arranged in table form are dimensional data, including conductor size, stranding, insulation, sheath and armor thickness, outer diameter and weight. National Electric Products Corp.

318 **Trolley Busway Systems**—Three bulletins offer real help on electrical installations involving cranes and hoists, assembly and production lines, moving test lines and other moving electrical equipment. Bulletin 35 (28 pp) covers 225-500 amp systems; Bulletin 50 (44 pp) 100 amp systems; Bulletin 45 (40 pp) 60 amp systems. Each includes special sections on installation planning and procedure, methods of mounting and descriptions and illustrations of equipment. Feedrail Corp.

319 **Asbestos Insulation**—"Specifications for Asbestos Varnished Cambric N.E.C. Type AVA Lighting Wire and Power Cables," 8 pp, establishes performance tests for asbestos insulation applied as a felted wall in combination with varnished cambric tapes for wires and cables with 600 and 1000 v ratings. Also measures plus values of the construction over and above industry standards. Standards for test characteristics, such as minimum permissible breakdown after initial dielectric test are covered. Rockbestos Products Corp.

320 **Switch Wiring Diagrams**—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters can be applied. Some of the diagrams incorporate more than one useful feature. Includes key to electrical symbols used. Allen-Bradley Co.

321 **Battery Manual**—Battery selection techniques are emphasized in 20-pp Bulletin 210, a revised edition of this manufacturer's manual on storage batteries for stand-by power, emergency lighting and switchgear applications. A discussion of charging equipment and simplified battery maintenance procedures is included. Storage battery installation procedures are described and illustrated by photos. Exide Industrial Div., The Electric Storage Battery Co.

322 **Handbook on Storage Batteries**—This 64-pp booklet on instructions and technical data is the sixth edition of this company's battery service manual. Provides a brief treatise on the theory of the lead-acid battery. Gives detailed instruction on the care and operation of batteries, on maintenance and repairs, and on standard and special parts. Booklet is of special value to plant engineers concerned with storage batteries for cycle service in industrial trucks and materials handling equipment. Gould-National Batteries, Inc.

323 **Motive Power Batteries**—This 48-pp general service manual on lead-acid batteries for all types of motive power application is a practical guide to industrial cycle service, including industrial truck, air conditioning, and others. Includes photos, charts, tables, methods of repair, maintenance and theory of operation, instructions covering repairs with regular or special tools, simplified testing methods, including safety practices, acid handling precautions, and charging methods. C. & D. Batteries, Inc.

LIGHTING

325 **Architectural Floodlighting** — Eight-pp Bulletin GEA-6437 illustrates various methods of floodlighting industrial plants, public and commercial buildings and others. Provides in-

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DATA FILE

(Begins on page 274)

formation on general purpose heavy-duty floodlights. Also contains tips on floodlighting of vertical surfaces and discusses four "musts" of an efficient economical floodlighting installation. A table of recommended foot-candle levels for exteriors provided. General Electric Co.

326 **Recessed Lighting**—Divided into sections to aid in selection of lighting units, this 36-pp catalog gives complete illustrations and detailed dimensional data for one- and two-foot architectural troffers in all types of ceiling construction. Includes information on various ceiling lighting patterns, plus selection of shielding designs in plastic, glass, lens (flat and dished), plastic louvers. Also gives photometric tables. Smithcraft Lighting Div.

327 **Outdoor Mercury Lighting**—"How Mercury Vapor Outdoor Lighting Brings More Night Action," 8 pp, stresses low cost and versatility of mercury vapor lamps. Shows their use in such locations as industrial areas, parking lots. Includes data on company's new Silver White lamp, which offers an increase in efficiency over clear lamps. Also features Golden Mercury Vapor lamp, which provides a "warmer" light and is a natural caution light. Sylvania Electric Products Inc.

328 **Plant Lighting Planning Guide**—This 32-pp handbook of industrial lighting presents economics of plant lighting program in terms of lower production costs, reduced working time, less fatigue and eyestrain, less spoilage, fewer accidents, better morale. Explains six major steps in initiating, developing and carrying out a lighting program; tells how to select equipment and stresses importance of maintenance. Includes table of recommended levels of illumination for industrial interiors. Benjamin Electric Mfg. Co.

329 **Lighting Unit Specifications**—The new 1957 edition of the "RLM Standard Specifications for Industrial Lighting Units" contains important revisions in specifications on both incandescent and fluorescent units, as well as new lighting data. Of special importance are new coefficient of utilization tables for eight units. Calculations are based on latest zonal method of computing coefficients of utilization and illumination on room surfaces. Also included are revised light distribution curves on RLM direct and semi-direct fluorescent units, popularly called "upward light." Candlepower distribution curves are plotted at normal, parallel and 45 deg. RLM Standards Institute.

BOILERS, GENERATORS

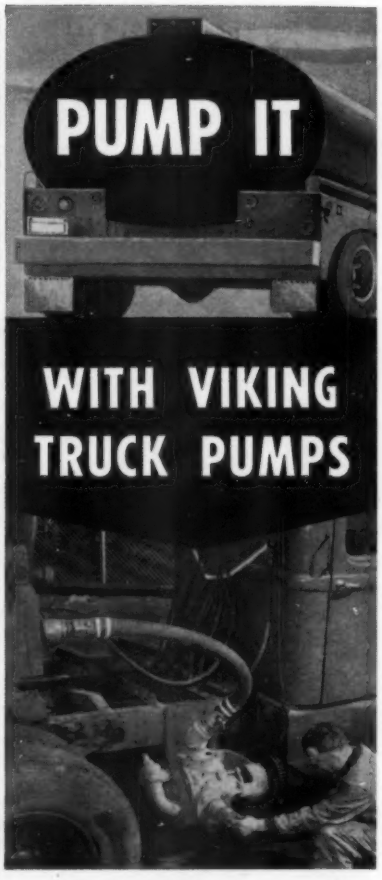
330 **Packaged Generators**—This 16-pp catalog covers a new series of packaged steam generators in sizes from 10,000 to 46,000 lb of steam per hour. Gives capacities, dimensions, construction features. Instrumentation is discussed. Illustrations include sectional drawings and installation photos. Booklet also provides a selection chart on firing equipment and controls. Foster Wheeler Corp.

331 **Automatic Boilers**—Bulletin BE-4 describes operation and advantages of Continental automatic boiler's spinning gas technique—a method of obtaining maximum heat transfer with a simplified design. Shows cutaway view of boiler construction; illustrates hinged doors and method of injecting air through static, turbine-like vanes into burner. Boiler Engineering & Supply Co., Inc.

332 **Hot Water Boilers**—Catalog HCC-2, 20 pp, describes and illustrates design, construction, advantages and economies of company's controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Comparison of heat content—water vs steam—is indicated on table, and schematic layouts are included. Photos of typical installations are also featured. Combustion Engineering, Inc.

SPACE, PROCESS HEATING

333 **Plumbing, Heating Supplies**—Edition H is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated; gives sizes, intended uses. J. A. Sexauer Mfg. Co., Inc.



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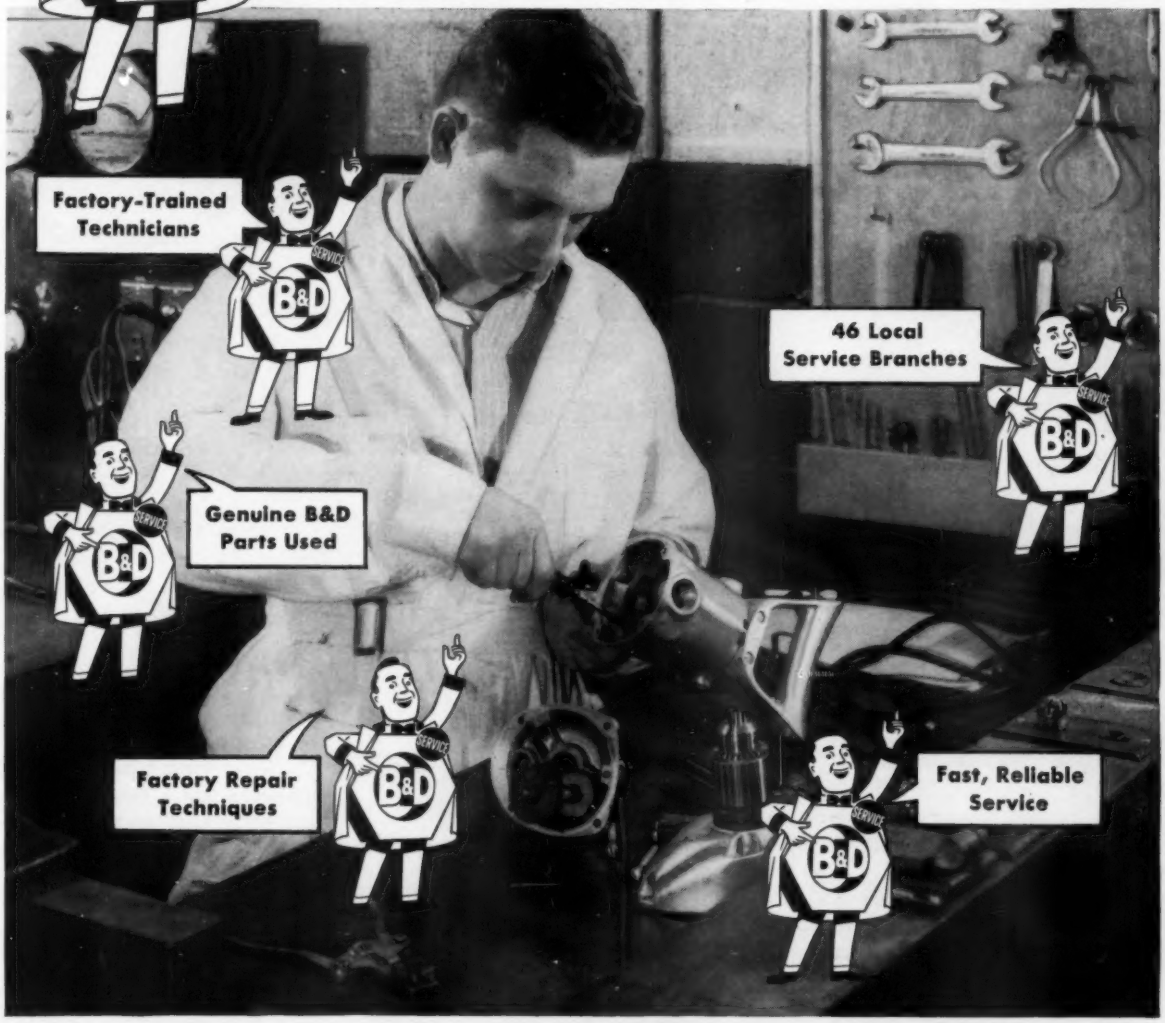

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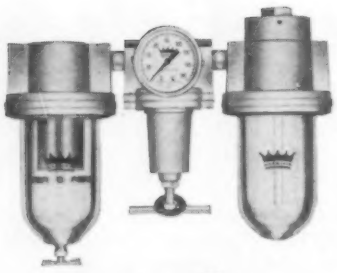

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DATA FILE

(Begins on page 274)

334 On Unit Heaters—Latest improvements, specifications and performance data for Herman Nelson horizontal and vertical unit heaters are covered in 36-pp Bulletin 700A. Includes complete hot water and steam performance tables, dimensions, selections, applications, descriptions of cabinets, elements, motor mountings, fans and accessories, controls. Also provided are suggested layouts, piping diagrams. American Air Filter Co., Inc.

335 Forced Air Space Heaters—Illustrated Bulletin 523-B, 12 pp, is devoted to a line of forced air heaters for comfort heating, year-round ventilating, tempering make-up air, process drying and heat curing. Explains design efficiency, construction details, operating principles and flexibility. Dravo Corp.

336 Industrial Ovens—Thirteen types of company's Conventioneered ovens, which apply principles of forced convection heating to various industrial processes, are illustrated and described in 12-pp Bulletin 200. These ovens serve foundries, metal finishers, plastics producers. The W. W. Sly Mfg. Co.

VALVES, TRAPS, PIPING AND ACCESSORIES

338 Bronze Valves—Globe and angle bronze valve with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions. The Walworth Co.

339 Diaphragm Valves—Catalog V-55, 34 pp, covers operation, installation and selection of diaphragm valves for handling of acids, alkalis, gases, volatile and viscous substances, water and other fluids, compressed air vacuum, slurries, semi-solids, beverages and food products. Diaphragm materials are described, selection tables included. Hills-McCanna Co.

340 Lubricated Plug Valves—Catalog PV-4, 36 pp, shows in detail a line of iron and steel lubricated plug valves. Many illustrations of single, screwed and bolted gland type valves are shown, including photos, sectional and detailed drawings. Also included is physical data on dimensions, ratings. The Wm. Powell Co.

341 High Pressure Valves—Bulletin B-451, 12 pp, contains complete engineering data on company's valves for high pressure and high temperatures. Typical installations are pictured, dimensions and weights are tabulated, and temperature-pressure ratings are shown. A selection table is included, as well as information on materials, design. Yarnall-Waring Co.

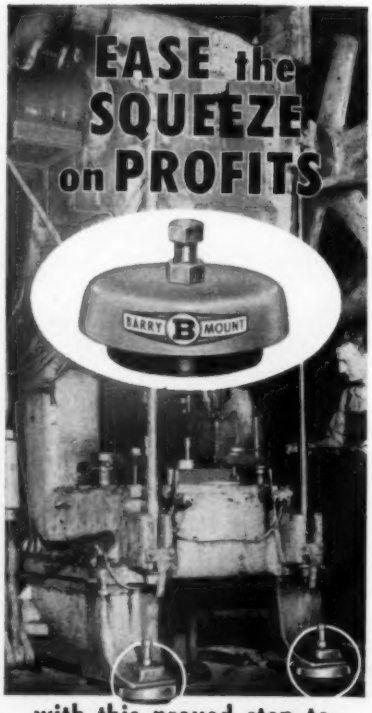
342 Corrosion-Resistant Valves — Eight-pp Bulletin 7 contains complete engineering specifications for company's corrosion-resistant valves, as well as photos of individual types in the line. An alloy availability chart is included. Alloy Steel Products Co.

343 Industrial Valves—Bulletin 507V illustrates and describes company's line of industrial valves for control of air, gas, liquids and solids. Features photos and descriptive detail on a variety of valves, including butterfly valves, wafer butterfly valves, slide valves, check valves, proportioning valves. W. S. Rockwell Co.

344 For Valve Selection—Circular 555, 24 pp, is designed as a guide for selecting valves, boiler mountings, and lubricating devices, including the LQ600 bronze globe valves, Luncor PVC all-molded valves, and solder end valves. Tables, technical data and information on the selection of valves, boiler mountings, and lubricating devices are completely indexed for easy reference. The Lunkenheimer Co.

345 Valve Performance Facts—Included in this 36-pp booklet are 32 case histories of cost-saving valve installations. Service applications covered include steam, oil, water, coating fluid, chlorine, phenol, pulp stock, vacuum, others. Industries include paper mills, refineries, central stations, other plants. Crane Co.

346 Plug-Type Valves—Long-life features of company's stainless steel plug-type valves are stressed in 6-pp Form 202-A. Cutaway



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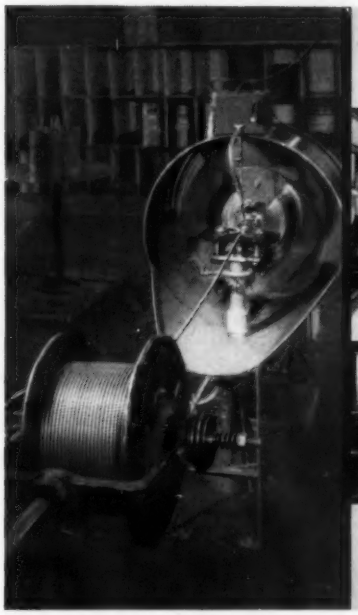

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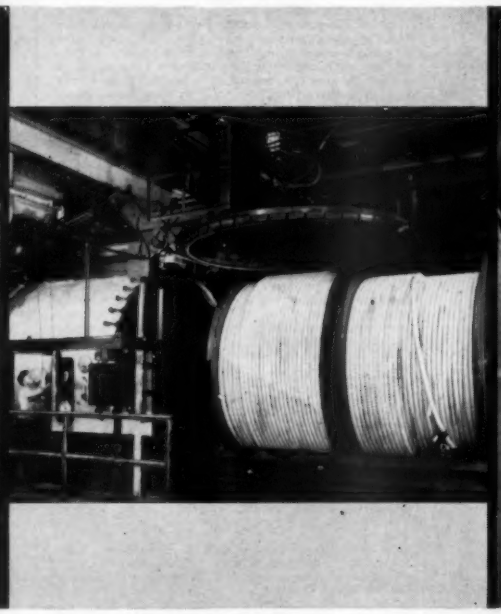

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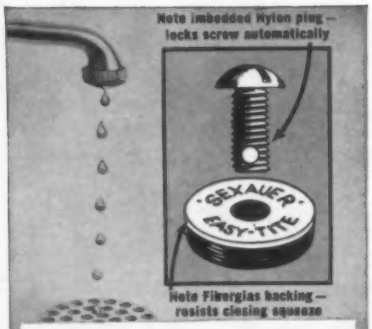

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DATA FILE

(Begins on page 274)

view illustrates important design and operation features, and tables. Jenkins Bros.

347 Steam Trap Book—Catalog J is a 44-pp manual and ordering guide in which 17 pp are devoted to data on fundamentals of good trapping and trap selection. Installation and maintenance instructions are also provided. Book lists steam traps for maximum pressures of 250, 600, 900, 1500 and 2500 psig. Included, also, is a section on trouble shooting. Armstrong Machine Works.

348 Steam, Air and Gasoline Traps—Catalog 751, 32 pp, is a trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for pressure up to 1500 lb. W. H. Nicholson & Co.

349 Pipe for Modern Buildings—This 16-pp booklet discusses wrought iron pipe for modern buildings. Identifies wrought iron pipe and describes composition and advantages. Included are sections on wrought iron's resistance to corrosion and fatigue stresses, weldability, forming and threading, as well as the application of protective coatings. A. M. Byers Co.

350 Fittings and Tubing—Steel and zinc coated fittings and tubing are described in illustrated bulletin SF-155. Advantages are detailed and installation diagrams are included. U. S. Hoffman Machinery Corp.

351 Improved Hose Coupling—A quick connect-disconnect hose coupling for water, oil, steam, gas and chemical lines is described in this 16-pp bulletin. Describes the coupling's construction and explains how it provides a sealing action which makes the coupling tighter as internal pressure increases, and a full swiveling action. Titeflex, Inc.

352 PVC Pipe Fittings, Flanges—This is a comprehensive 12-pp catalog on corrosion resistant pipe fittings and flanges in normal- and high-impact grades, rigid, unplasticized polyvinyl chloride. Shows characteristics, advantages and limitations. Lists operating pressures, temperatures, applications, price comparisons, fabrication advice, installation and supporting recommendations, dimensions and weights. Grinnell Co., Inc.

353 Bellows Design Guide—Twenty-pp Catalog 155 contains helpful information on applications, design considerations, and standards for metallic bellows. Details on using bellows manufactured from various metals are included. Tables supplement text. Flexonics Corp.

LUBRICATION

355 For Better Lubrication—Advantages of company's lubricants which are specially compounded for lubrication of reduction gear drives are outlined in pocket-sized folder. Features which assure smooth, trouble-free gear drive performance and lower maintenance costs are listed. Gulf Oil Corp.

357 Detergent Oils—How to clean sludge out of hydraulic and lubrication system without shutting down machines is told in Technical Bulletin 44. Also tells how continued use of these highly detergent oils keeps equipment as clean as new. Sun Oil Co.

358 Lubricant Data Book—The 16-pp current edition of this company's popular Lubriplate Data Book offers practical information on lubrication of machinery. Gives product data on grease type and fluid products, hydraulic oil, compressor oil, motor oil. Suggestions on applying lubricants under normal and special conditions are provided. Several pages are devoted to lubricant recommendations for equipment used in a variety of industries. Lubriplate Div., Fiske Bros. Refining Co.

359 Multi-Purpose Grease—This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Tells how it resists leakage, affords protection. Socony Mobil Oil Co., Inc.

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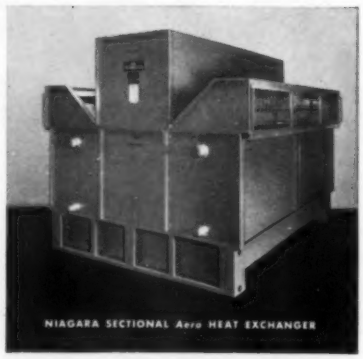

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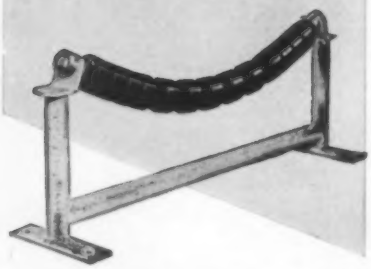

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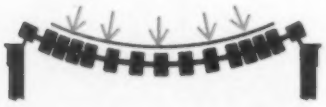

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DATA FILE

(Begins on page 274)

INSTRUMENTS, CONTROLS

360 **Versatile Electronics** — How flexibility of electronic temperature controls makes them useful in a wide range of heating and air conditioning installations is explained in this 16-pp booklet, Bulletin SA-2681. Purpose of publication is to fill the gap between the theory of electronic bridge circuits and specific control layouts and circuit diagrams. Four basic features that give electronic control its flexibility and broad application are described. Minneapolis-Honeywell Regulator Co.

361 **For Industrial Metering**—Practical selection and application data on meters for industrial liquids are provided in 20-pp Form 566. Explains value of metering in batch mixing, process and cost control. Illustrated charts show how to select the proper meter according to type, temperature and flow rate of liquid to be metered, and include specifications for models shown. Strainers, valves and other accessories are described. Neptune Meter Co.

362 **Thermostatic Shower Control**—Safety advantages of the Hydroguard thermostatic controls for showers are outlined in illustrated Bulletin 366. Design and construction details are shown, capacity, and applications in industrial plants cited. The Powers Regulator Co.

363 **Gages, Needle Valves** — Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. A section on accessories is included, as well as one on specification, covering gage dimensions, dimensional diagrams, dial graduations, and other data. Needle valves also described. Jas. P. Marsh Corp.

MECHANICAL POWER TRANSMISSION

364 **Roller Chains, Sprockets**—Catalog 754, 64 pp, describes, illustrates a line of roller chain stock sprockets, including minimum bore sprockets for reboring, also finished bore and Taper-lock bushed sprockets which are ready to use. Tables show speed ratios for sprocket combinations, standard keyways and setscrews. Includes chain selection and application data, installation and lubrication recommendations, chain length calculations, dimensions and price lists for single and multiple strand roller chains. Diamond Chain Co.

365 **Sprockets and Chain** — Bulletin A-624 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. Devotes a page to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper-Lock bushings; and full information is given on riveted and cotter-type roller chains. Dodge Mfg. Corp.

366 **Helical Gear Drives**—A new line of in-line helical gear drives is described in 16-pp Book 2651. Load classes for over 250 applications, overhung load ratings and dimension tables, instructions for proper selection and cutaway views of both double and triple reduction drives are given. Link-Belt Co.

367 **Fluid Drive** — Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation are covered in detail and selection tables are provided for direct connected and V-belt types. American Blower Corp.

368 **Magnetic Drives**—Data on design, drive features, opening and performance curves, output torque rating-dimensions, selection chart, as well as photos of installations and applications are included in 6-pp Bulletin W-T 1-57. Whitney Chain Co.

369 **Power Transmission Equipment**—Form 1200, 12 pp, describes a full line of conservatively rated equipment for various power transmission requirements, including flexible couplings, variable speed pulleys, variable speed

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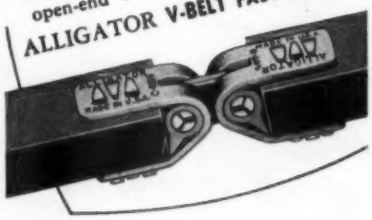

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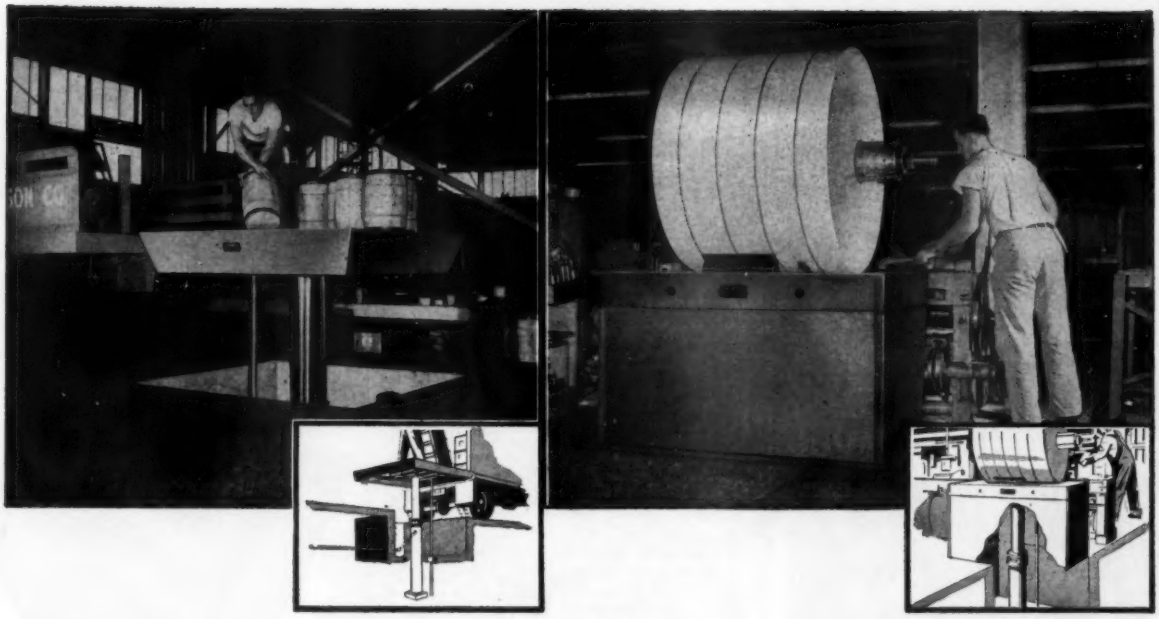

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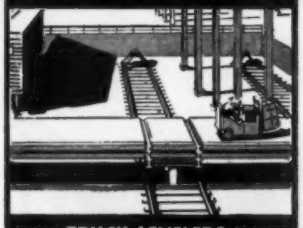

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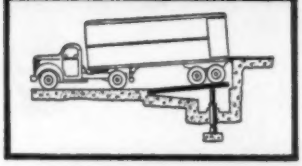

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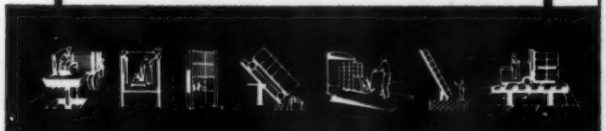

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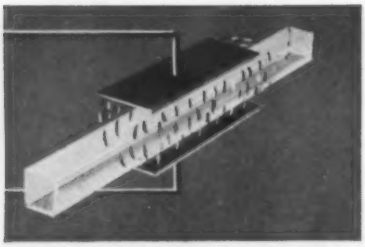

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DATA FILE

(Begins on page 274)

belts and sheaves, variable speed transmissions, motor bases, and universal joints. Dimensional and capacity data are tabulated. Lovejoy Flexible Coupling Co.

370 Fluid Couplings—Bulletin 144-D, 14 pp, presents complete installation and performance data on fluid couplings. Illustrated with diagrams and drawings, bulletin shows ease of applying company's fluid couplings on any type industrial equipment, powered by any type electric motor or internal combustion engine from 3/4 to 850 hp. Describes standard models providing standard input, output combinations, and standard models in packaged units. Installation hook-ups are given, along with typical applications. Twin Disc Clutch Co.

371 Flexible Couplings—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail. Thomas Flexible Coupling Co.

372 Spacer Coupling — Of special interest to plant engineers concerned with operation of many pumps is Manual 4838 on this company's Type F Steelflex spacer coupling which has a quick-disconnect feature. Step-by-step illustrations show how to install, remove coupling and lubricate it during assembly. Process pump selections are tabulated, dimensional data included. The Falk Corp.

PUMPS, COMPRESSORS

374 General Purpose Pumps—Section B, 36 pp, describes rotary pumps for general purpose use. Explains positive displacement principle incorporated, gives suggestions for selecting proper materials of construction. Application and ordering information is provided on mounted and unmounted small pumps, large mounted pumps, pumps for operations requiring greater sealing, and large, totally enclosed models. An engineering section covers recommended speeds and capacities. Viking Pump Co.

375 For Abusive Pumping Jobs — Catalog 4906, 36 pp, covers centrifugal pumps for wide industrial use and especially adapted to handling ashes, abrasive mixtures, slurries, hot and corrosive liquids. It describes several basic types; a horizontal shaft, single-stage side suction pump; a horizontal shaft, single-stage, rear-entrance automatic priming pump; vertical shaft pumps with standard, overhead and quill bearings for wet pit applications. Nagle Pumps.

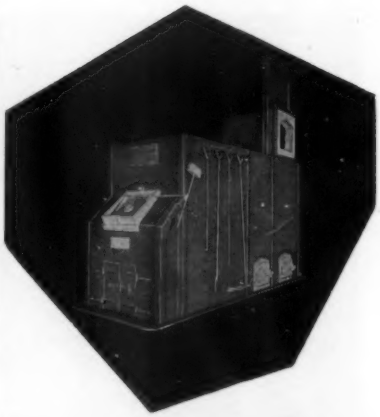
376 Continuous Flow Pump—Bulletin 30-C, 8 pp, outlines advantages of company's Moyno pumps which handle a variety of materials—from free-flowing liquids to non-pourable pastes, abrasives, solids. Describes principle of operation, discusses performance, construction, capacities, and includes photos, diagrams and specifications. Robbins & Myers, Inc.

378 Submersible Pumps—Bulletin P55-123, 12 pp, describes advantages of company's submersibles and tells how they solve various pumping problems. Design features are illustrated through cutaway views. Four basic types are shown, and a handy selection chart is included. Byron Jackson Co.

379 Industrial Compressors—Bulletin SSB-56 covers company's complete line of industrial air compressors from the 1/2 hp to 150 hp, including the accessories that go to make a complete installation. Photos of the various models are included, as well as specifications and dimensions. Schramm, Inc.

380 Air Compressors—Bulletin A-62, 20 pp, covers construction, operation information on company's class WN-112 heavy-duty air compressors. Illustrates five models of compressor, for displacement capacities from 368 to 974 cfm at sea level, and four high altitude models for 532 to 1100 cfm. Joy Mfg. Co.

381 Portable Compressors—Twelve-pp Catalog GG-9A pictures 40 models of company's portable type compressors. A quick reference chart shows capacities, engine types, and



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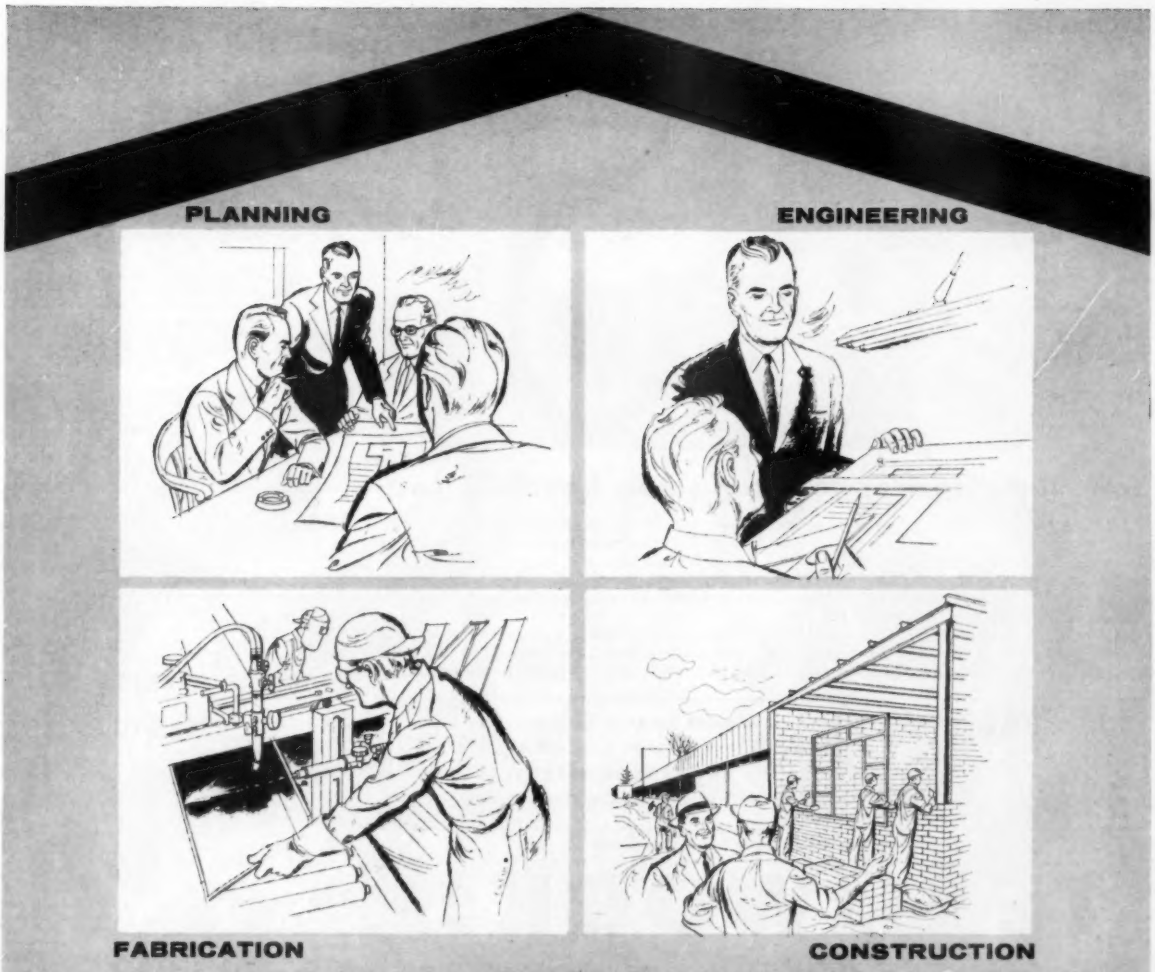

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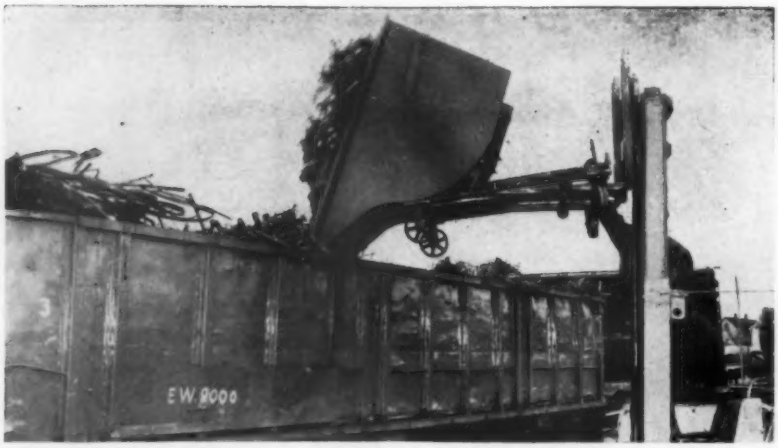

Self-Dumping Hoppers cut scrap handling cost

A messy, time-consuming salvage operation was turned into a neat, one-man job for the Verson Allsteel Co., Chicago. By switching from wheelbarrows and scoops to Roura Self-Dumping Hoppers, "scrap segregation was also made practical for the first time." Now a worker moves through the plant shoveling steel filings, turnings, cuttings, and other scrap into several dozen Roura Hoppers. Then with a standard lift truck, he moves the Hoppers to semi-trailers outside the factory. With a flip of a handle, each Hopper dumps itself, rights itself, locks itself, and is then moved back for another load.

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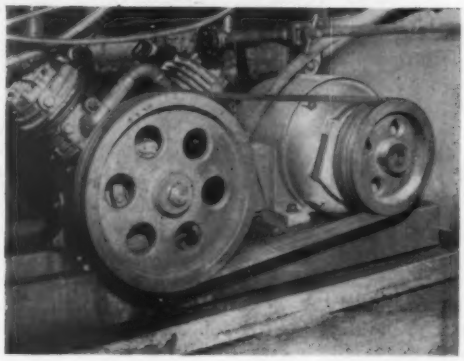

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DATA FILE

(Begins on page 274)

mountings available. Illustrates such features as: replaceable cylinder sleeves, interchangeable valve parts, aircraft type compressor cylinders, heavy duty industrial type engines. Le Roi Div., Westinghouse Air Brake Co.

382 Air Cooled Compressors—Bulletin AC-15, 16 pp, shows a complete line of small, air-cooled compressors for industrial, and other use. Both one- and two-stage compressors are covered, with working pressures ranging from 85 to 175 psi. Complete specifications for each model are given and two charts—one for figuring compressor needs and another showing estimated air consumption for 30 common shop jobs—are printed. Gardner-Denver Co.

383 For On-the-Spot Air — Eight-pp Form 2302 features company's self-contained Spot-Air portable compressor. Deals with the many tools it will operate, with actual on-the-job illustrations pointing out added advantages of this light-weight compressor on jobs where bigger compressors are not needed. Ingersoll-Rand Co.

384 Turbo-Compressors—Bulletin 126-A, 12 pp, describes company's turbo-compressors which are designed to deliver constant pressure at all loads. Advantages are detailed, design and applications described, and pressure ratings of turbo-compressors shown on table, as well as vacuum ratings of vacuum producers. The Spencer Turbine Co.

PACKINGS, GASKETS, SEALS

385 Teflon Products—Three bulletins present this company's Teflon packings, gaskets, special parts and stock. Bulletin CP552 describes Chempro lines of Teflon ring packing, Teflon impregnated asbestos packing, V-type packing and Teflon seal cage—for use with acids and strong chemicals. Bulletin CP553 covers Teflon jacket gaskets, solid ring gaskets, expansion joints and special gaskets. Bulletin CP554 illustrates special parts. Chemical & Power Products, Inc.

386 Improved Packings—Advantages of company's Chevron packings for rams, plungers and reciprocating rods are illustrated and described in 8-pp Catalog AD-115. Tables show general recommendations for packings against various pressures, approximate depths, suggested sizes for homogeneous V packings for hydraulic equipment and other data. The Garlock Packing Co.

MAINTENANCE

387 Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of good re-roofing job. Johns-Manville.

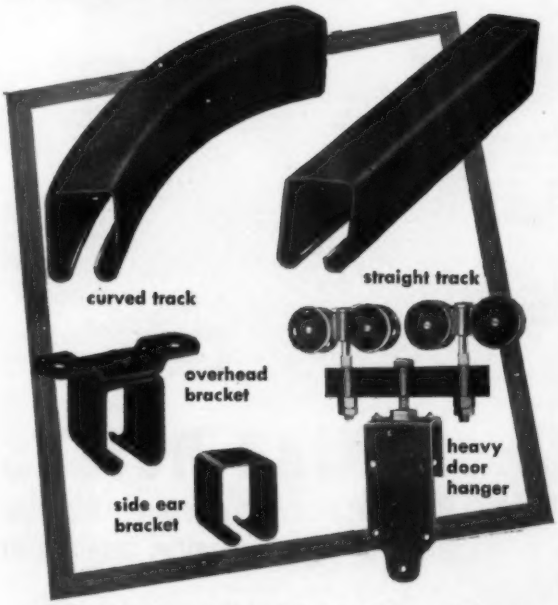
388 Painting with Aluminum—This helpful booklet describes advantages of aluminum paints, describes three basic types for non-absorbent surfaces, for weather-exposed wood, and for heated surfaces and those not exposed to weather. Typical maintenance applications are covered in text and picture, and practical suggestions for good results included. Use of aluminum paint on various surfaces is detailed. Aluminum Company of America.

389 Protective Coatings—Corrosion control in the operating plant is the subject of this bulletin, which outlines several corrosion-resistant coatings systems for buildings and equipment, structural steel, towers and columns, tanks and piping. Properties and uses are given and basic requirements for control of corrosion are detailed. Bulletin also gives data on tank linings. Amercoat Corp.

390 Guide to Corrosion Prevention—How Bitumastic protective coatings aid in fight against corrosion is told in this 12-pp booklet. Discusses corrosion as a universal industrial problem, role of protective coatings in cutting costs and lengthening service life of structures and equipment, and gives data on several coal-tar-based coatings intended to solve a variety of corrosion problems. Twelve typical case

COBURN

HEAVY-DUTY SLIDING DOOR HARDWARE MEETS EVERY PLANT REQUIREMENT



For both new and remodelled buildings, Coburn Sliding Door Hardware is ideal for every type of sliding door—straight sliding, sliding-folding, around-the-corner, roundhouse and fire doors.

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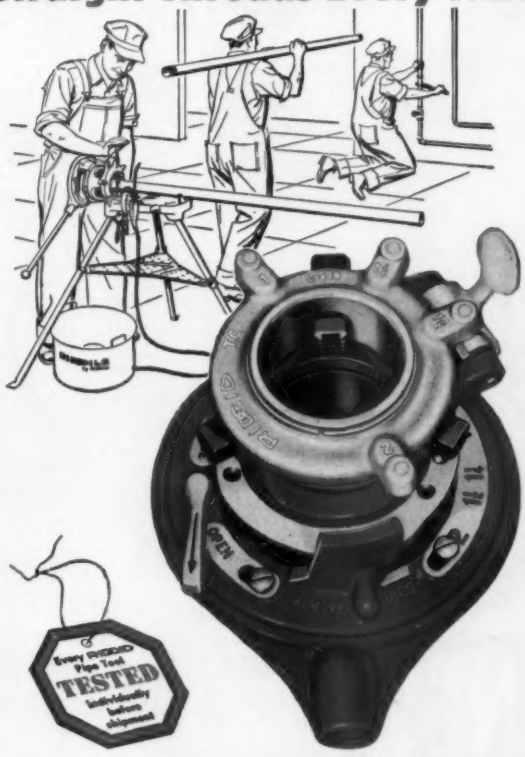

... Revolutionary New TC (True-Centering) Workholder centers all pipe, even over or under size

No more crooked threads! 65R pre-sets to size by turn of TC Workholder gauge ring —tightens by palm-of-hand push on forged cam lever. All 3 jaws close together on pipe by one mechanical action. Always straight threads, jamproof, 1″ to 2″ with 1 set of dies, fast size change—only 65R offers you so much for your money. Buy it at your Supply House.

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RIDGID
Work-Saver Pipe Tools

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DATA FILE

(Begins on page 274)

histories covering use of these coatings in varied industries described. Koppers Co., Inc.

391 **Insulation Coating**—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's NoDrip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Lists applications and describes methods of applying. Contains tabulated data on quantity required to cover various size tanks and pipe. J. W. Mortell Co.

392 **Guide to Maintenance Products**—Catalog 56, 48 pp, on industrial maintenance paint products lists specialized coatings to resist alkalies, acids, oils, grease, moisture. A complete buyers' guide, this book includes, besides maintenance coatings, waterproofing, roof coatings, caulking compounds, floor patching materials. Gives technical information on paints for wet walls in food processing plant; epoxy resin coatings offering high resistance to strong acids and chemical salts; a rust inhibitive paint for iron and steel surfaces and a fast-drying floor coating. Steelcote Mfg. Co.

393 **Guide to Coatings**—This 1957 Coatings Manual is a 32-pp treatise highlighting the stopping and preventing of rust on nearly all types of rustable metal. Illustrated in full color, this book contains information and recommendations to enable accurate determination of specific coatings needed for the job. Basic principle of Rust-Oleum's fish oil penetration into pores of metal is illustrated. Application photos give new ideas for protecting girders, tanks, boilers, roofs, other surfaces. Over 100 color chips show colors available in primers, short-oil and long-oil coatings. Galvinoleum, heat resistant, chemical resistant, and floor coatings are covered. Rust-Oleum Corp.

394 **Better Floor Care**—This illustrated folder describes products designed to aid efficient floor care. Lists combination Scrubber-Vac machines, conventional scrubbing-polishing machines, steel-wool pads, applicators, vacuum cleaners, mop trucks and other mopping equipment. Included are waxes, sealers and cleansers. Finnell Systems, Inc.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

396 **Data for the Shop**—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals, drill grinding charts, twist drill sizes and other data. Standard Oil Co. (Ind.)

397 **Portable Electric Tools**—This standard catalog, Form 10, 24 pp, features portable electric tools, including electric drills, bench-drill stands, hole saws, buffing and polishing kits, sanders, polishers, grinders, hammers, saw blades, vacuum cleaners and others. Photos included. The Black & Decker Mfg. Co.

398 **Pipe Tool Ordering Guide**—Catalog 2-51, 8 pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives prices. Armstrong Bros. Tool Co.

399 **Pipe Tools**—Ordering and application information on Ridgid pipe tools is provided in 16-pp illustrated Catalog 7596R-5. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives, pipe and bolt threading machines, oilers. Capacity, price data included. The Ridge Tool Co.

400 **Where to Use Your Stud Driver**—Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wood into steel and steel into steel, as well as their use for attachment of pre-drilled fixtures. Remington Arms Co., Inc.

401 **Industrial Tools**—Hand tools and shop tools for production lines, maintenance work and service departments are featured in 108-pp Industrial Catalog 54-1. Loaded with pictures and tool facts, the book describes in detail the complete line of over 4,000 tools—including chests and cabs, wrenches and sockets, screwdrivers, pliers, pulling equipment, tool assortments and many others. Snap-On Tools Corp.

402 **Portable Tools**—Industrial construction and other portable power tools for the manufacturing, construction, woodworking and metalworking industries are described in this 50-pp catalog. Tools appear in logical sequence of size and duty rating. Specification tables at bottom of each page permit easy selection of tools. Accessories for all tools are also cataloged. Skil Corp.

403 **Electrode Guide**—Catalog 1318 is a 58-pp pocket guide to electrode selection. Mechanical properties and testing of electrodes, specifications, classification and properties of electrodes, are among the data featured, and different types of electrodes for a variety of applications are described. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

VIBRATION CONTROL

404 **Vinyl Machinery Mount**—Advantages of company's vinyl machinery mount are outlined in this illustrated brochure. Installations in a representative plant are shown. Clark, Cutler, McDermott Co.

405 **Improved Machine Mounts**—This brochure describes advantages of company's leveling machine mounts. Tells how they enable installation and leveling of heavy machines without bolting or shims, afford increased machine mobility, reduce maintenance costs, lessen noise. Barry Controls, Inc.

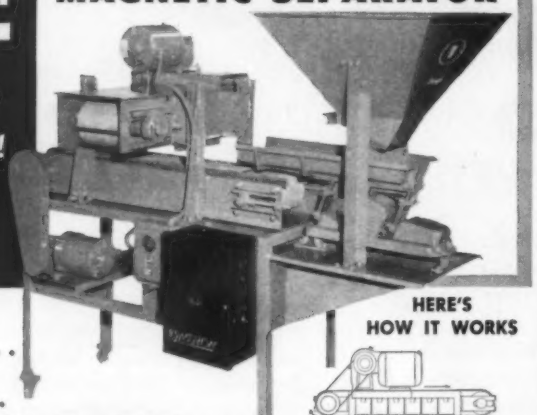
CONSTRUCTION

407 **Aluminum Building Products**—Form AD 285 is a 32-pp catalog covering com-

NEW!

DINGS general-purpose MAGNETIC SEPARATOR

portable!
automatic!
labor-saving!



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Just wheel this new Dings Type TBS all-purpose Magnetic Separator right up to the job! It saves time and labor, increases production. Quality of separation and product purity are improved because the feed rate can be controlled . . . magnetic intensity can be adjusted . . . and all magnetic particles are lifted out of the material.

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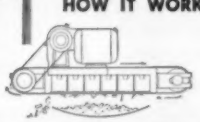

- The Dings TBS consists of a hopper with an adjustable gate, vibrating feeder, and Self-Cleaning Perma-Plate Magnet, all mounted on a portable conveyor. A controlled, even layer of material is fed to the conveyor, and as it passes under the magnet, iron is lifted out of the burden. Magnetic attraction holds the iron on the underside of the moving cross-belt until it is discharged off to one side. Operation is automatic and assures maximum iron removal at all times.

TBS-227 1/3

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New Dings TBS Units are completely field tested for effective performance, and are available for prompt delivery. For full details, write for Bulletin 1215-A.

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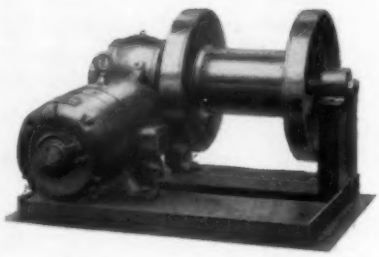
ELECTRIC AND GASOLINE
for every industrial requirement



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Lever or push button control electric hoists for pulling, hoisting, elevating. Single, double, and triple drum hydraulic controlled hoists. Complete range of sizes. Car pullers, winches and capstans.

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moves more air at less cost

...powerful roof ventilator with

***NEW** Smoke-Trip® Damper Opener*

Because Propellair Sky Blast roof ventilators do not need the usual restricting weather cover which deflects and reduces air movement, they move more air at less cost. Fumes and heat are thrown high into the air, can't re-enter windows or turn downward to create roof maintenance problems. Their efficiency is not effected by wind velocity or direction. Weatherproof dampers open automatically when fan is started. Hot-dip galvanized after fabrication, Propellair Sky Blast ventilators are ruggedly built to give years of maintenance-free service. Available in sizes from 16" to 60" for 2820 to 78,800 CFM—PFMA Certified Ratings.

If desired, exclusive new Smoke-Trip heat-actuated venting device which automatically opens dampers in case of fire to exhaust smoke and fumes is available.

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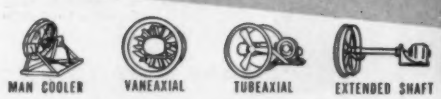

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DATA FILE

(Begins on page 274)

pany's line of aluminum industrial building products. Cites advantages of aluminum, pictures some installations. Installation data, weights, dimensions and roughing-in details are provided on corrugated roofing and siding, V-beam roofing and siding, ribbed siding sheet, perforated corrugated sheet, flat flashing sheet. A discussion on sandwich wall system is presented. Accessories and fasteners are also covered. Aluminum Co. of America.

408 Steel Buildings—Manual SX-14456, 8 pp, features the Steelox panel method of construction. Among industrial buildings and others illustrated are frameless, rigid frame, shed roof and utility types. Accessories and special features of the steel buildings are also covered. Simplified construction, neat appearance, low maintenance, and other advantages are touched upon. Armco Drainage & Metal Products, Inc.

409 Panel Wall Construction—The advantages of company's M-Type Q-Panel walls are outlined in 12-pp Bulletin Q35-55. Includes installation photos, diagrams, specifications, as well as drawings, pointing out structural details. H. H. Robertson Co.

410 Partitions and Walls—Low cost sound-absorbing partitions and walls designed for movable and flexible office enclosures are featured in this illustrated bulletin. Dimensional diagrams and specifications are included, as well as photos of typical installations. GR Products Inc.

411 Standardized Construction—This 28-pp illustrated catalog on company's system of standardization in building construction presents a description of "F" buildings, a versatile series of flat-roof structures. Also features rigid-frame "A" series, offering clear spans of 100 ft and over; "B" series, center-column buildings where large clear spans are not required; "C" series, clear spans with crane runways. Luria Engineering Co.

412 Steel Floor Plate—Skid resistance and other advantages of multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, weights, data on allowable loads. United States Steel Corp.

413 Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features; gives fabricating data. Alan Wood Steel Co.

SLINGS, CHAINS

414 Sling Chain Handbook—Illustrated Data Book 100, 32 pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of sling chains and attachments, and their sizes, weights and working load limits under many conditions. Columbus McKinnon Chain Corp.

415 Sling Handbook — The 64-pp Tuffy Sling Handbook is replete with illustrations, charts and diagrams describing 16 factory fitted slings and nearly two dozen standard fittings available for slings, including several which are recent additions to the line. Book contains a complete rigger's manual, shop chart of ratings, an engineer's notebook and standard signals for directing operations of overhead traveling cranes and derricks and locomotives. A new development featured is the steel ferrule splice now on Tuffy slings. Union Wire Rope Corp.

MATERIALS HANDLING

417 Electric Hoists—Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data, specifications included. Wright Hoist Div., American Chain & Cable Co., Inc.

418 Overhead Dispatch System — Form F 192, 8 pp, describes an automatic overhead dispatch system designed to solve a variety of materials handling problems. Outstanding advantages are listed and typical installations are described and illustrated with detailed diagrams. Component equipment utilized in this system is individually illustrated and described. Richards-Wilcox Mfg. Co.

419 Engineered Conveyor Systems—Catalog 835, 32 pp, illustrates conveyor systems in use in a wide range of industries, showing how they suit handling requirements involved. Roller, wheel, belt, chain, overhead trolley and elevating conveyors are included, also spirals, portable power conveyors, ball transfers and special equipment. Mathews Conveyer Co.

420 Steel Conveyor Belts—"A profitable approach to the selection of steel processing conveyor belts" is the subject of this 16-pp bulletin. Simplified selection, standard specifications, and installation information are included. Photos and diagrams illustrate the text. The Colorado Fuel and Iron Corp.

421 Electric Fork Trucks—Two electric fork trucks designed for high maneuverability, ease of maintenance, and operator comfort and convenience are introduced in two 6-pp bulletins. Bulletin 1324 covers a 4000-lb capacity model; Bulletin 1325, a 6000-lb truck. Performance, specifications, dimensions, details on controls and construction are given, features explained, and attachments shown. Baker-Raulang Co.

422 Handling Cost Cutter—Bound in loose-leaf style, the Materials Handling Cost Cutter tells how mechanized materials handling can cut handling costs in a variety of jobs and industries. Case histories of actual applications are cited, equipment and methods described, and a list of trucks and attachments "keyed" to the particular job and field. Profusely illustrated, catalog includes a section on industrial truck specifications. Automatic Transportation Co.

423 Load Handling Equipment — Bulletin 406, 24 pp, covers company's Budgit, Tugit and Load Lifter products and other load handling specialties. Catalog numbers, sizes and specifications are tabulated, and application photos of the various products are included.

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IS NOW IN HANDY
SQUIRT CANS!

A powerful blend of quick-acting, super-penetrating solvents, not to be confused with ordinary penetrating oils. Harmless to all metals. Frees parts frozen by rust, corrosion, scale, paint, varnish, carbon, or gum.

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GASKET AND JOINT
SEALING COMPOUND

Heat-proof, vibration-proof, non-solvent, non-shrinking, non-crumbling, non-cracking . . . for every gasketing and sealing requirement. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion and seizure of joints.

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Solder Seal

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Better PIPE TOOLS

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"ARMSTRONG BROS." drop forged Pipe Cutters are built for lifetime service with 1-piece drop forged steel heat treated body and a replaceable hardened steel nut to take up the wear and thrust to handle screw. Used either as 1-wheel (with 2-rollers) or 3-wheel (for close quarters).

"ARMSTRONG BROS." Knife Blade Cutter Wheels are machined from special alloy tool steel properly heat treated. They cut rapidly and easily, hold their keen edge.

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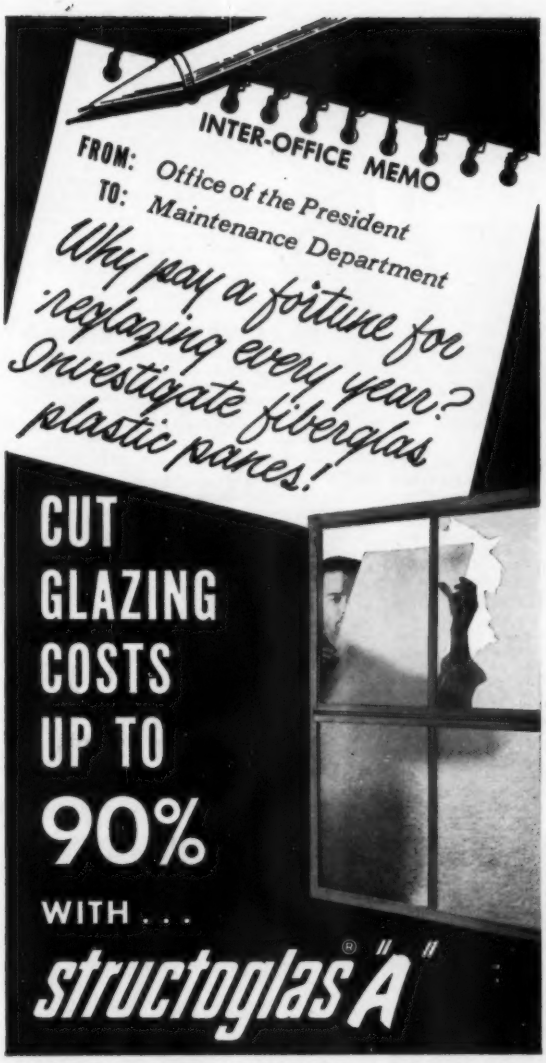
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For replacement of **continuous top-hung sash**, or **ordinary factory sash**, STRUCTOGLAS "A" panels provide tremendous savings in materials, labor and future maintenance costs.

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. . . from initial resistance to 1.00" wg with positive air cleaning results

The secret is (1) Extra large dust storage capacity (**holds more dirt per cubic inch of filter medium**) plus (2) a new FREE-FLO air cleaning action.

Cleans air without strangling air stream. Allows **faster release** of air from filter's air cleaning medium.

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Reduces maintenance up to 50%. Evans adhesive has built-in detergent for double-quick cleaning.

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(Begins on page 274)

Complete specifications and principal dimensions tabulated. Manning, Maxwell & Moore, Inc.

424 **Cost-Cutting Materials Handling**—"The How Book of Cost-Cutting Materials Handling," is a 24-pp booklet covering various phases of the materials handling problem and their effect on industrial production. Text and pictures cover such subjects as fundamental handling motions, advantages of planned material handling practices, analysis of handling organization, collecting handling data, diagramming route of travel, and the use of particular materials handling equipment. A "Vis-O-Graf" summary on procedures to check efficiency of system included. The Yale & Towne Mfg. Co.

425 **Oil-Hydraulic Lifts** — Catalog RE-203, 20 pp, covers the field of heavy-duty oil-hydraulic lifting devices for industrial applications. Featured in catalog are company's standard Levelator lifts, a 6000 lb single-jack model and a 12,000 lb dual-jack lift. Also featured is an electric pump mounted on an oil tank for powering oil-hydraulic devices. Illustrates lift platforms, platform accessories and safety devices, jacks, power units. Rotary Lift Co.

426 **Sheet Lifter** — Operational and design features of company's sheet lifting equipment, which contribute toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. Cullen-Friestedt Co.

427 **Electric Freight Elevator**—Bulletin A-414, 12 pp, contains design and operation information on company's plunger electric freight elevator designed for low-rise, light and heavy duty freight handling requirements. A sectional diagram points out component parts, and an installation diagram and size and capacity table are included. Otis Elevator Co.

428 **Automatic Dockboards**—Bulletin D-160 describes company's automatic dockboards for fast, safe, mechanized materials handling. Features of the dockboards are illustrated and described, and general specifications included. Bulletin 181 covers specifications and layout for recessed models and package units. The Kelley Co., Inc.

429 **Automatic Ramp** — Power-operated, automatic-leveling dock ramps for either air-oil (air compressor) or electric operation are described in this 6-pp bulletin. Design and construction features are illustrated, and specifications are included. Globe Hoist Co.

430 **Self-Dumping Hoppers**—Bulletin 250 describes self-dumping hoppers reported to cut cost of hand unloading at least 50 per cent. Details rugged construction of the units, safety catch incorporated, other features. Standard models are pictured, as are some typical jobs handled. Roura Iron Works.

431 **Handling Baskets** — Bulletin B-54 describes company's complete line of standard and custom-engineered Eezy-Stak parts handling baskets, for machinery, washing, plating. Wire & Iron Products, Inc.

432 **Industrial Casters** — Various types of casters for industrial applications are pictured and described in this large chart designed for wall mounting. Covers light duty, light-medium duty, medium duty, medium-heavy duty, heavy duty, extra heavy duty, trailer series, and special duty casters, and includes complete selection tables. Faultless Caster Corp.

STORAGE EQUIPMENT

433 **Adjustable Shelving**—How this shelving can save assembly time is explained in 28-pp Form 2111. Photos and drawings of various types of shelving units, including open and closed shelving, bin units, ledge shelving, counter shelving, cabinets with swinging and sliding doors, parts and accessories are included. Standard Pressed Steel Co.

434 **Storage Equipment** — Catalog 100-E, 72 pp illustrates and describes company's complete line of steel cabinets, folding chairs, chests and safes, stools, tool boxes, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and other specifications. Photos illustrate some typical equipment installations. Lyon Metal Products, Inc.

435 **Storage Racks, Bins**—Many innovations in the Sturdi-Bilt adjustable storage rack and steel bulk bin lines are described in two bulletins offered by the company. Bulletin BB-956 covers steel bulk bins, with easy-to-follow charts for planning storage needs, and diagrams demonstrating construction principle for instantaneous readjustments. Bulletin SR-956, 8 pp, covers adjustable storage racks, with specification chart, suggestions for multiple uses, and photos of typical installations of this storage equipment. Sturdi-Bilt Engineering Co.

FANS, VENTILATING

436 **Standard Duty Fans**—Designs and construction details of company's line of standard duty fans are covered in 28-pp Bulletin 543. Points out advantages, shows arrangement and application, describes accessories. Tables list specifications. The New York Blower Co.

437 **Industrial Fans**—Propellair Bulletin 650, 12 pp, contains dimensions, application, and performance data on Tubeaxial and Stack-booster fans. Gives information on cooling and drying problems, system and open surface tank ventilation. Robbins & Myers, Inc.

438 **Propeller Fans**—Pictorial Bulletin FM-2345, 24 pp, describes design and fabrication of heavy-duty propeller fans and related package units. Covers various types of power roof ventilators, water coolers, heat pump installations, dual service condenser, and evaporator packages, fan assemblies for dry coil condensers, air washer and scrubber installations, stainless steel equipment for corrosive conditions, and others. Sizes, capacities and construction data included. Buffalo Forge Co.

439 **Ventilating Equipment**—A 36-pp guide to selection of propeller fan type ventilating

Fire cracks flywheel... Ni-Rod "55" repairs 2,800-lb. casting

Welding saves $30,000 to $60,000 in downtime loss

Flames leaped up from the transmission belt of this cast iron flywheel. And when cold water from fire hoses cracked a flywheel section, the owner was in *hot* water!

The wheel is part of a Corliss steam engine — *only* source of power for 14 roughing and finishing stands at Wickwire rod mill, Cortland, N. Y. *The damaged casting couldn't be replaced in less than 30 to 60 days — and downtime would cost $1,000 a day.*

With easy-handling Ni-Rod "55"* electrodes, company weldors repaired the casting in less than one day. Produced strong welds that hold firmly as the 2,800-lb. segment spins through space *at more than 60 mph!*

There's no trick to welding cast iron with Ni-Rod "55". No special welding equipment. No special welding skill. Even weldors of limited experience produce sound, ductile welds without difficulty.

Want more information about cast iron welding? Write for our folder called "Repair Cast Iron Parts Quickly and Easily." Illustrated with *many* interesting case histories.

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The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK **WELDING PRODUCTS**
Electrodes • Wires • Fluxes

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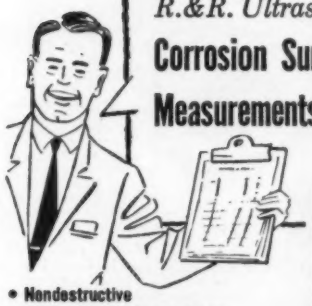

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Corrosion Surveys & Thickness Measurements—*FROM ONE SIDE!*

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Roberts & Randolph Ultrasonics Co. will send an experienced expert . . . using a portable, battery-operated Audigage . . . to measure thickness of your pressure vessels, piping, tanks, boiler tubes, ship hulls and bulkheads, etc. . . . *in your own plant.*

WRITE FOR DEMONSTRATION—Have an R.&R. Ultrasonics man demonstrate their nondestructive measuring method and show how it can save you time, money and equipment. No obligation, of course.

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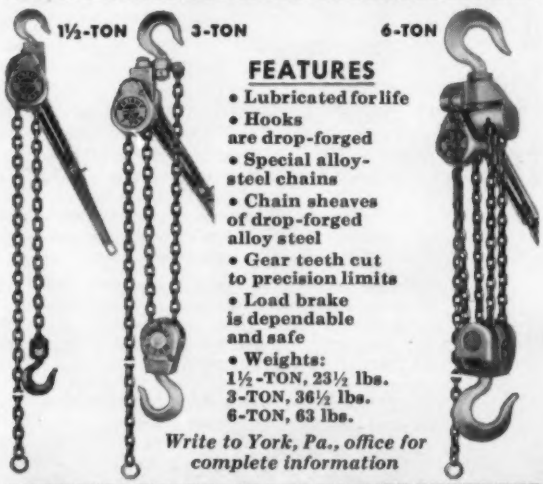
THREE SIZES—1½, 3 and 6-Tons



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- Chain sheaves of drop-forged alloy steel
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ESTABLISHED 1879

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Representatives in Principal Cities

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• Material Handling • Radial Bladed • Small Exhaust

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DATA FILE

(Begins on page 274)

equipment, Catalog 152 includes specifications and installation data on company's propeller fans in portable, tubeaxial, centrifugal, roof ventilator and other types. Detailed illustrations of contruction features accent design and performance factors. Case study photos show installations. Ilg Electric Ventilating Co.

DUST CONTROL

441 **Dry-Type Filters**—Bulletin 600, 8 pp, describes company's Staynew ventilation and air conditioning filters. Specifications, engineering, performance and installation data covering dry type panel filters for the removal of air-borne impurities given. Dollinger Corp.

442 **Industrial Dust Control**—A wide variety of collection methods for industrial dust control is described in 16-pp Bulletin 922. A typical case history is included, as well as photos, cutaway views, drawings and capacity data on the various units. Pangborn Corp.

443 **Hydro-Filter** — Bulletin 556 describes outstanding feature of company's hydro-filter for industrial dust collection. Cutaway view shows construction and design details, and diagrams showing dimensions and a table of capacities included. National Dust Collector Corp.

444 **Precision Air Cleaning** — Design and principles of air filtering employed by company's air filter are covered in this loose-leaf file of bulletins. Includes data on test dust used to determine capacity, loading characteristics, resistance, air cleaning performance of all types of mechanical air filters. Applications are listed and complete specifications included, as well as efficiency charts. The George Evans Corp.

445 **Dust Filter** — Advantages offered by company's type RJ dust filter are listed in Bulletin 560. A cutaway view points out construction details and table lists capacity ratings. The Day Co.

446 **Flexible Tubing**—Spiratube A and R—flexible, lightweight, reinforced fabric duct designed for carrying air and other gases, many solids, and liquid at low pressure—are described in 8-pp Bulletin 10C-1. Applications are described, and performance data and specifications are included. Flexible Tubing Corp.

447 **Electric Precipitators**—The use of electric precipitators in the recovery of fine dust particles is described in 26-pp Bulletin 104. A cutaway view of company's electric precipitator showing component features is included. Advantages of the electric precipitation system are detailed, as well as installation procedure and other data. Buell Engineering Co.

FILTERING

448 **Filters, Strainers — Industrial Catalog** 1054, 48 pp, provides application and engineering information on company's line of microfilters and precision strainers. Fuel filters, full flow and by-pass lube filters, air separators, and metal edge strainers for fuel lube and industrial use are presented along with construction details, specifications. Purolator Products, Inc.

449 **Filter Fabric Facts** — This 16-pp illustrated booklet contains information about filtration principles; filtering devices; filter media; textile fabrics for filtration; a comprehensive chart on chemical and heat resistance of cotton and synthetic fabrics; sections on yarns, fabrics construction and finishing; and a round-up of filter fabrics in use. Wellington Sears Co.

450 **Filter Guide**—This 8-pp general bulletin illustrates six major filter types for industrial applications: disposable media gravity type, combination gravity and magnetic, straight magnetic vacuum, pressure and screen-type settling filters. Applications covered include all types of fluids from water to heavy viscosity oils. Descriptions of filter operation are given as well as applications, degree of filtration and flow rate capacities. Industrial Filtration Co.

PLASTICS, SYNTHETICS

451 **Phenolic Plastics**—A primary evaluation of the properties of company's phenolics and the combinations in which they are available, in thermosetting molding materials and industrial and coating resins, is featured in this illustrated bulletin. Properties and applications are indicated on a chart. Durez Plastics Div., Hooker Electrochemical Co.

452 **Super Polyethylene**—A new type of polyethylene which has greater heat resistance, greater structural stiffness, and better appearance than previous types, is the subject of 16-pp Bulletin C-5-216. Properties of the thermoplastic material are detailed, as well as uses. Chemical Div., Koppers Co., Inc.

453 **Solution Resins**—This folder contains a series of bulletins on solution resins, covering six Exon vinyl chloride resins for solution coatings. Outstanding characteristics of each resin are described and a graph showing the solubilities of these resins in methyl ethyl ketone is included. Solution viscosity tables, data on formulating and other information included. Chemical Sales Div., Firestone Plastics Co.

METALS

454 **Ductile Iron** — Cast iron that can be bent is described in this 28-pp revised edition, with tables, charts and photos. Photos show applications of ductile iron castings, and bulletin lists typical applications in various industrial fields. The International Nickel Co., Inc.

455 **Special Steels For Industry**—This 232-pp ring-bound catalog is designed to show the industrial steel user at a glance the complete range of grades and sizes available from stock, describing over 700 products. Its index lists 16 categories of special purpose steels, including high speed, tool, stainless, alloy and machinery, available in 16,000 grades and sizes. Over 20 estimating, conversions and weight tables as well as other information are also included. Book is available to qualified plant engineers. Please state your job title when requesting it. Crucible Steel Co. of America.

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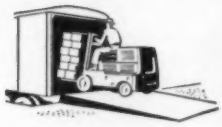
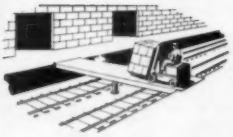
OILDRAULIC® POWER

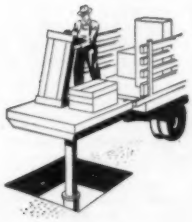
Cuts the cost of lifting heavy loads



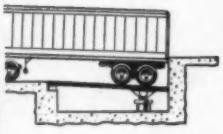
Leva-Dock Ramps



Transfer Bridges



Levelator Lifts



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Type A centrifugal basic pump. Suction and discharge in lower half of casing.

45° A **NEW SERIES AURORA®**
TYPE A
Two Stage Diagonally Split Case
MULTI-PURPOSE PUMPS 45°

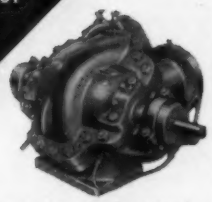
Suited to BOILER FEED, Hot or Volatile Liquids duties etc., etc.

Low NPSH Characteristics

Being Self-Venting, Will NOT VAPOR LOCK

MANY BENEFITS

45° split case offers substantial new advantages while retaining all of the best features of the horizontally split case pumps—in that the entire rotating element can be removed without disturbing piping or disturbing the pump-motor-base alignment. 45° split allows both suction and discharge to be in the bottom half of casing but above the center line of the pump.



Aurora Type AJ Centrifugal Pump with Water Cooled Bearings and Stuffing Boxes

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THE COSTLY PROBLEM caused by dripping from this sweating pipe was permanently solved with one easy and inexpensive application of NoDrip Plastic Coating. Sweating pipes, ceilings, air ducts and other metal equipment are also completely protected against rust and corrosion by low cost NoDrip.

NoDrip Plastic Coating acts immediately to insulate and protect. One application adds many years of service life to metal equipment. NoDrip is also resistant to acid, alkali and brine...protects concrete, brick, plaster, tile wood or composition surfaces.

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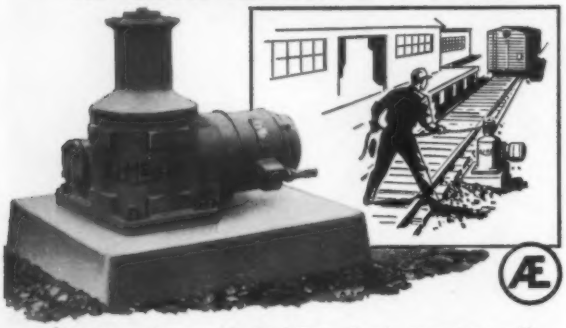

IF YOU actually saw a Lo-Hed Car puller in operation you'd probably order one in a hurry. It is a first rate investment — pays for itself fast. It puts a stop to shifting charges. Cars get loaded and unloaded in record time. Demurrage charges are slashed. Industrial accidents are minimized... And a Lo-Hed Car Puller saves money *inside* a plant, too — pulls loads in a straight line, up grades and around corners.

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WHIP THE HIGH COST OF REMODELING

Modernize offices with these economical wall-type partitions. 100% salvageable for later remodeling. Easiest walls to install or move. Panels are packed with acoustical spun glass to deaden noise. For a real eye-opener in economy partitions, write for your free illustrated folder today.

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DATA FILE

(Begins on page 274)

OTHER EQUIPMENT

456 **Magnetic Selection Guide**—Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lifting magnets, serves as handy guide to selection. Dings Magnetic Separator Co.

457 **For Shell Molding**—"Plaskon Resins for Shell Molding," 32 pp, describes shell molding process for casting metals. Includes design and production considerations such as cost; available types of molding machinery and selection factors; gating techniques and precautions; pattern design; resin bonding of shell molds; special metals handling; and sand reclamation. Detail drawings and sketches show representative shell molding machinery, typical pattern designs and techniques. Barrett Div., Allied Chemical & Dye Corp.

458 **Air Conditioning System**—Eight-pp Bulletin 121 describes an air conditioning system which supplies fresh air with moisture removed in the summer and added in winter, under control that is maintained in "in between" seasons. Typical installation is illustrated. Niagara Blower Co.

459 **Protective Clothing**—Catalog 12000, 12 pp, describes and illustrates company's line of industrial clothing for protection against water, fire, acids and alkalis, slipping and scuffing. Various types of work gloves and suits and coats are featured, and protective features are pointed out. The B. F. Goodrich Co.

To receive catalogs circle item numbers on the Reader Service Cards provided on pages 269-270. You may also use the cards to order any literature mentioned in the ads.

460 **Cream Deodorant Soap**—How company's SBS-60 cream deodorant soap eliminates soap waste, reduces soap costs, cuts maintenance and offers other advantages is told in this illustrated bulletin. Answers to questions concerning its properties are included. Sugar Beet Products Co.

461 **Draft Creator**—Capacity data for Quickdraft units are presented in 8-pp Form QF-SD. Seven capacity tables provide means for determining capacity of standard units when installed under hundreds of different conditions. An insert pictures and describes typical installations of the units. Quickdraft Co.

462 **Hydraulic Cylinders**—Catalog 200-6, 26 pp, describes company's hydraulic cylinders for die casting, pushing, lifting, holding, pulling, tilting, clamping, pressing, turning, squeezing and other power movements in any direction. Construction features and specifications are detailed, sectional drawing showing component parts is included, as well as dimensional and mounting data. Logansport Machine Co., Inc.

Increase Storage Capacity with a C-F LIFTER

Here's 1 man—a C-F Lifter and an electric hoist handling 5 ton packs of sheet steel with speed, safety and economy. One C-F Lifter handles a wide range of sizes . . . adjustments are made by the operator in a few seconds, permitting the Lifter to shift from wide to narrow sizes in a few seconds. Made in capacities from 2 to 60 tons.

Write for Bulletin SL-30 for specific examples of C-F Lifter operation and economy.

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MARSH *Mastergauge*

The gauge that has everything!

- **LEAK-PROOF ONE-PIECE CONSTRUCTION** . . . bourdon tube fused to socket and tip by exclusive "Conoweld" process.
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- **PRECISION "MASTERGAUGE" MOVEMENT** . . . with such exclusive features as the coined sector gear.
- **AVAILABLE WITH STAINLESS TUBE AND SOCKET** . . . choice of stainless steels and alloys for all corrosive conditions.
- **WITH "RECALIBRATOR"** . . . quickest and best way to keep a gauge accurate.

These features are combined only in "Mastergauge", standard bearer for the broad line of Marsh Gauges . . . each the best of its kind. Ask for data.

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Staggered starting of electric motors . . .

AGASTAT

Time / Delay / Relay

AGASTAT allows you to stagger the starting of three motors without imposing their load on the line at the same time.

The AGASTAT is
- **electrically actuated, pneumatically timed.**
- **light, versatile, dependable.**
- **instantaneous recycling.**
- **adjustable in timing from 0.1 second to more than 10 minutes.**
- **available in AC or DC models which offer delays on energizing and de-energizing, manually-actuated time delay switch, remote push button control, hermetically-sealed units.**

Write our application engineers for help with your timing problem. Address Dept. A25-626

AGA DIVISION

Elastic Stop Nut Corporation of America

1027 Newark Avenue, Elizabeth, New Jersey
Pioneers in pneumatic timing.

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. . . for industry . . . for institutions . . . for residences

★ NO MOTORS, FANS OR BEARINGS IN EXHAUST LINE
★ NEEDS NO STACKS ★ ACID RESISTING VITREOUS ENAMEL FINISH

FOR INDUSTRY, Quickdraft excels in venting paint booths . . . abrasives . . . corrosive gases . . . noxious fumes . . . high temperatures and moisture. Its blower operates in clean or outside air. It eliminates down-time for cleaning and replacing fan blades. It improves industrial venting and reduces maintenance costs!

FOR INSTITUTIONAL AND COMMERCIAL BUILDINGS, Quickdraft efficiently vents heating plants, water heaters and incinerators at roof level. It saves the cost of building unsightly tall stacks.

FOR RESIDENCES, Quickdraft makes low, cold and erratic chimneys function. On and off with the fire, Quickdraft maintains constant draft required for efficient and economical combustion of all fuels. It eliminates pulsating or chattering, puffing, smoking and sooting.

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NOW, all sizes can be furnished with static pressures up to 10-inches . . . and in Type-1 Rigid Polyvinyl Chloride for withstanding highly corrosive acids.

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DATA FILE

(Begins on page 274)

463 **Brinemaking Manual**—Details on modern brinemaking methods and equipment are presented in 12-pp Manual 135. Three types of brinemakers are described, as well as a wet salt storage system, and cutaway views and diagrams are included. Morton Salt Co.

464 **Chemical Control and Testing** — The need for intelligent chemical control and testing to assure the success of a water conditioning program is described in this 6-pp pocket-sized folder. Emphasizes need for explicit control limits and chemical tests to show that these limits are being met, and the proper technical skill required to prescribe these limits. Hall Laboratories, Inc.

465 **Cathodic Protection**—This 12-pp illustrated technical brochure presents cathodic protection systems for corrosion control. Describes effect of galvanic action on metals in contact with earth or water, and explains principles utilized by these systems to halt existent corrosive action or keep new installations free of it. Savings gained by such protection are discussed and case histories given. Some typical applications are shown, and company's engineering services told. The Harco Corp.

466 **Carbon-Graphite Materials**—Characteristics of mechanical carbon-graphite materials are detailed in this 16-pp illustrated bulletin. Physical properties are described and load rating charts included, as well as information on standard grades, bearings in operation, seal rings, and other applications. Several typical examples of use of carbon-graphite bearings, wheels and sheaves in a wide range of industries are pictured and discussed as to resulting benefits. Electro-Nite Carbon Co.

467 **Belt Fasteners** — Bulletin F-112A describes belt fasteners designed to join conveyor and elevator belts in every width. Also covers rip plates for repairing jagged rips and tears, scraper plates and applications tools. Contains photos showing installation, selection data, list prices. Flexible Steel Lacing Co.

468 **Industrial Finishing Equipment**—Catalog A-657, 12 pp, describes a complete modern finishing system for cleaning, rust proofing, drying, painting and finish baking operations. Typical finishing systems handling a variety of products are pictured. The R. C. Mahon Co.

469 **Television Equipment** — Twenty basic applications for "TV Eye" low-cost closed circuit television equipment are described and pictured in Form 3R2335. Folder explains equipment's functions and operation, lists specifications. Radio Corp. of America.

470 **Neoprene Design Book**—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Elastomers Div., E. I. du Pont de Nemours & Co.

471 **Abrasion, Corrosion Protection** — This 24-pp book illustrates how company's rubber faced steel plate reduces maintenance cost resulting from abrasion or corrosion. Shows case histories in a wide variety of industries. The Gates Rubber Co.

472 **Production Control System, Procedures**—Publication X-1268, 56 pp, details a method of material control intended to result in a shorter planning cycle while speeding production by eliminating cause of delay on the production lines. Illustrated with typical forms and charts, book outlines procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Remington Rand Inc.

473 **Water-Cooled Stoker**—Design and operating advantages of the Vibra-grate Stoker are outlined in this illustrated bulletin. A large cutaway view details component parts of the stoker and explains operating features. Other drawings show typical installations. American Engineering Co.

474 **Industrial Leathers** — These illustrated data sheets cover company's leather products and include belting. Also give data on leather packings for hydraulic and pneumatic equipment. J. E. Rhoads & Sons.

475 **Incinerators** — "The Incinerator Blue Book" is a 16-pp bulletin on incinerator developments, covering design features, methods of feeding or charging of refuse, waste analysis, and other information. An incinerator selection chart, classification of incinerators, capacity and dimension data and incinerator specifications are included. Joseph Goder, Inc.

476 **Fighting Corrosion With Corrosion**—Cathodic protection against rust and corrosion is the subject discussed in this illustrated 10-pp bulletin. Describes the corrosion battery, corrective measures, cathodic protection battery, and includes design and application data. Electro Rust-Proofing Corp.

477 **Equipment Selector Charts** — Bulletin CE-50, 20 pp, contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings; valves; pumps; rubber-lined tanks. American Hard Rubber Co.

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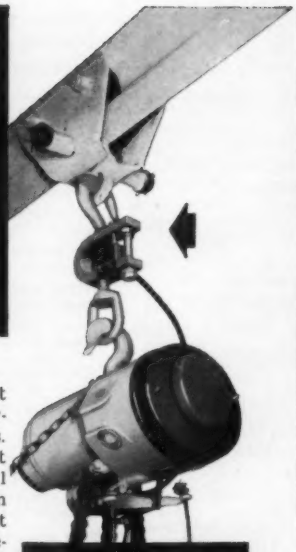

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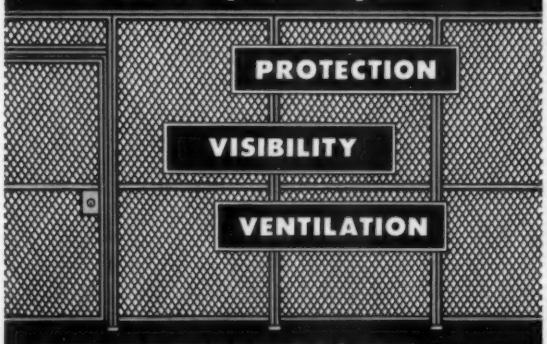

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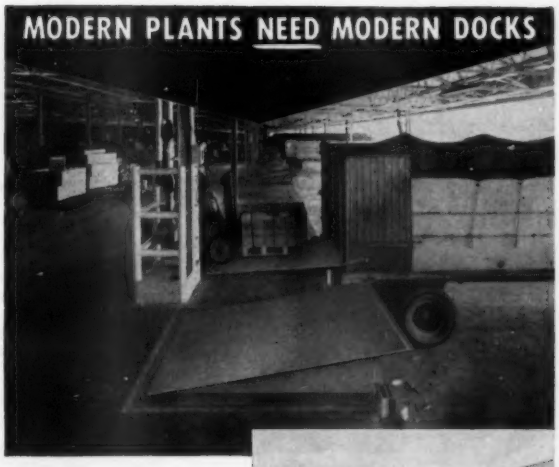

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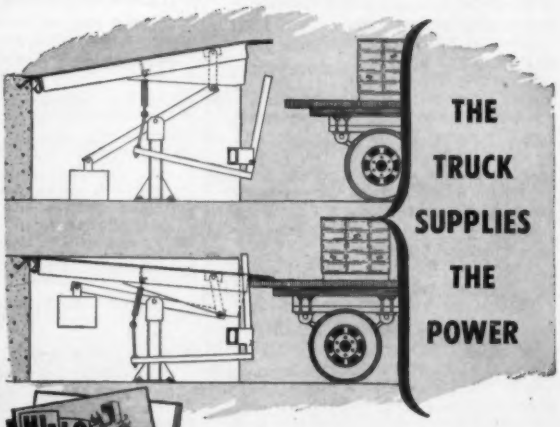

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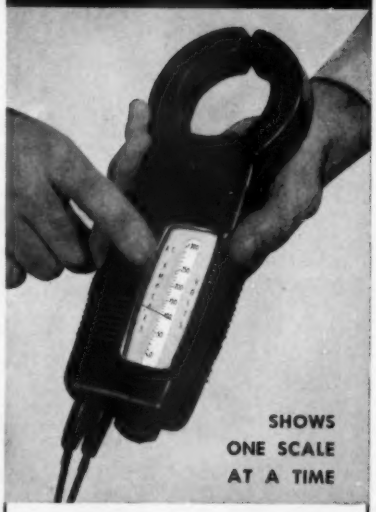
G-E Hook-on Volt-Ammeter Helps Avoid Reading Errors



RANGE AND SCALE of this G-E instrument show simultaneously by simply turning the fingertip control knob. Seeing only one range and scale avoids reading errors.

SCREW-IN VOLTAGE LEADS and recessed terminals provide maximum protection for the operator. Voltage leads cannot be pulled out accidentally.

WIDE RANGES ARE AVAILABLE in both models of the G-E hook-on volt-ammeter. Ranges of the AK-4 model are 0-10/30/100/300/800 amperes and 0-150/300/750 volts. The AK-5 ranges are 0-5/20/80/-350 amperes and 0-150/300/750 volts. The wider range AK-4 model has a pointer-stop for accurate checking of surge readings.

FOR FURTHER INFORMATION, write Section 582-20, General Electric Co., Schenectady 5, New York and ask for bulletin GEA-6292, or contact your nearest G-E Apparatus Sales Office or Distributor.

Progress Is Our Most Important Product

GENERAL ELECTRIC

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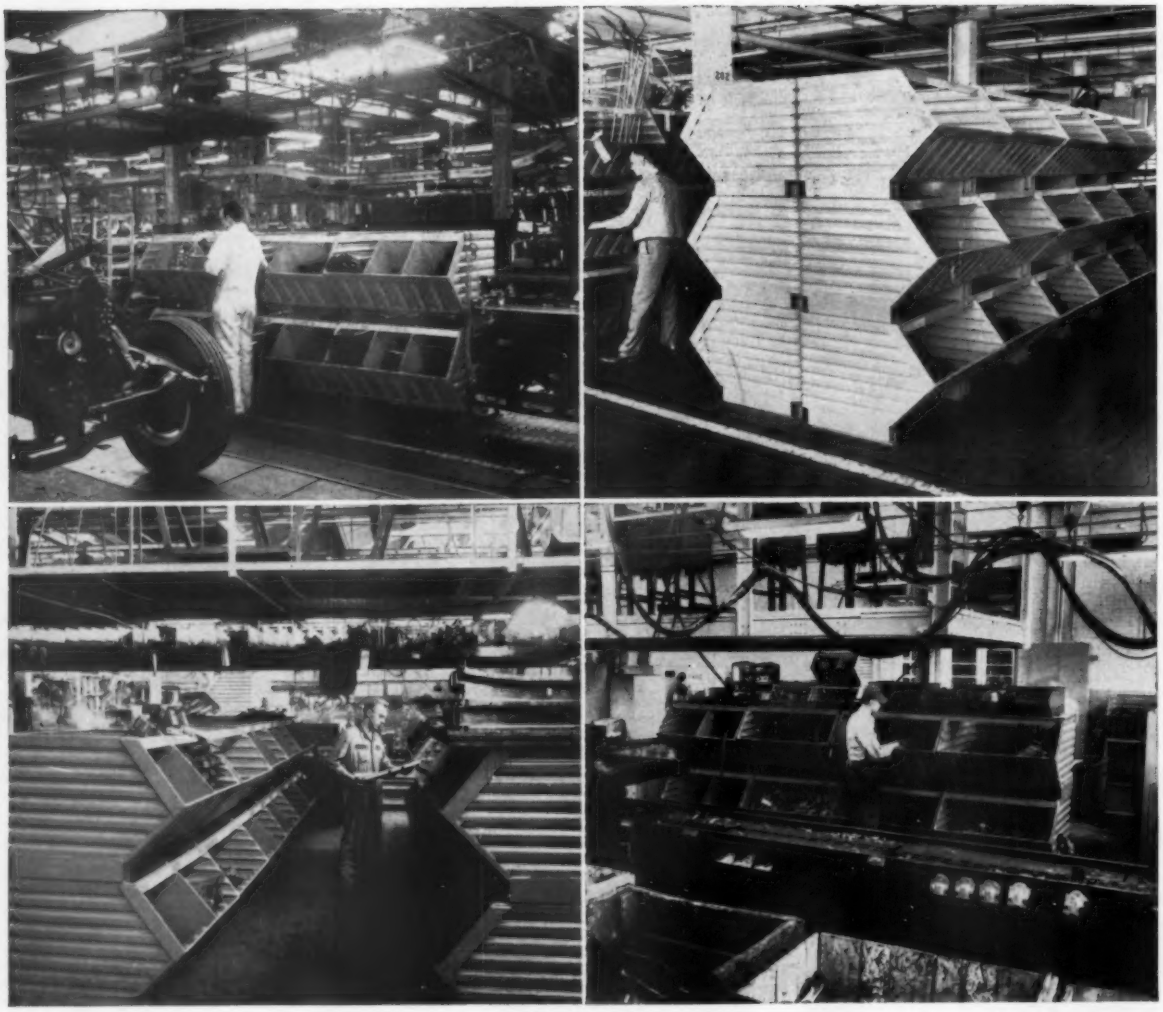

Simplified Handling and "On-Stream" Inventory of a wide variety of parts and assemblies has saved International Harvester's Fort Wayne Motor Truck Plant substantial production hours and hundreds of feet of floor space. This saving was made possible by the new Powell designed tapered, open-end stacking unit that is equally efficient as a storage bin or a working hopper box. This is another example of Powell's long-recognized ability to design and build handling equipment to exactly meet job requirements.

POWELL PRESSED STEEL SINCE 1920

The Powell Pressed Steel Co.

Dept. 867 Hubbard, Ohio

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KEEP IT CLEAN by Phil Tration

An inscrutable Bar-keep named Hugh
made martinis in Filters, "Staynew."
The results were uncouth—all gin, no vermouth
But, oh how his clientele grew!

Howsomever, the uses for Dollinger Filters do seem unlimited. Every day some bright engineer figures out a new way to save his company money just by installing the right filter, at the right place in a liquid, gas, or air line. (Be surprised what that does for the engineer's reputation too.)

If you have an idea for saving money with filters, and you'd like to talk with someone about it . . . may we suggest you contact someone with a *complete* line, someone with a little "know-how," someone with a reputation for quality . . . someone like your Dollinger sales engineer.

STAYNEW MODEL CPH PIPE LINE FILTER

has the exclusive "double action principle." Air is first deflected to outer walls of Filters and forced downward at high speed. Water, oil, and heavier particles of rust, etc. are thus deposited in base. Mechanically cleaned air then rises to pass through filtering medium which removes lighter airborne particles. This "double action" design eliminates need for frequent cleaning.

Inexpensive, simple to install, Dollinger Pipe Line Filters pay for themselves in reduced maintenance alone. Why not talk over your filtration problems with a Dollinger engineer . . . or write for Bulletin 200 which gives engineering data on pipe line filters. Dollinger Corporation, 55 Centre Park, Rochester 3, N.Y.

REG. PROTECTOMOTOR U.S. PAT. OFF.

STAYNEW **DOLLINGER**

FILTERS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

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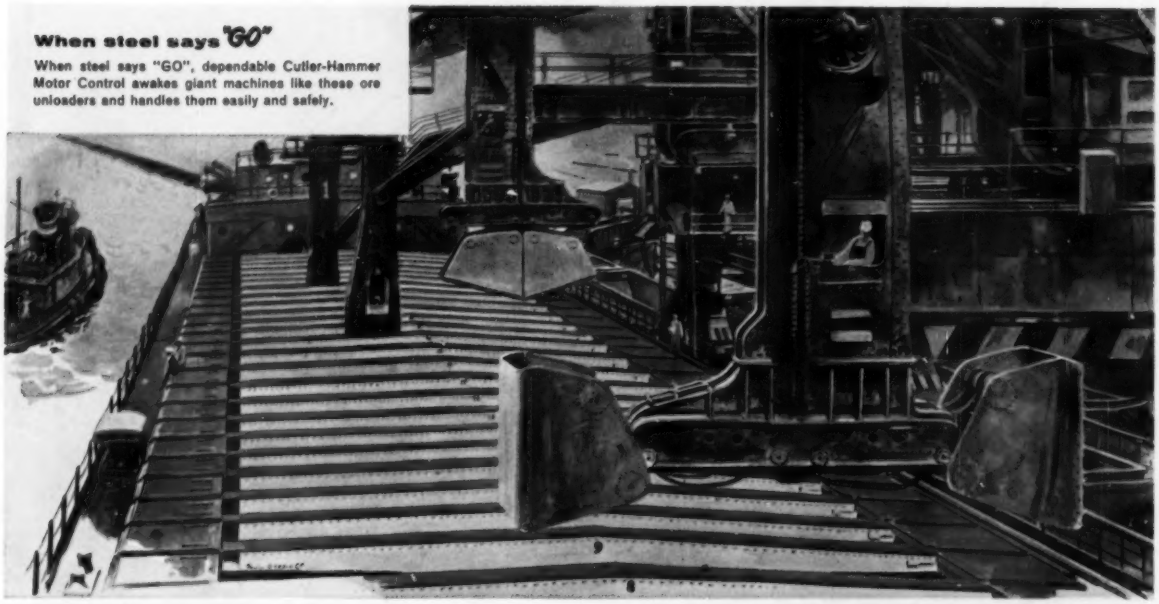
Steel sets a stiff pace



When steel says "GO"

When steel says "GO", dependable Cutler-Hammer Motor Control awakes giant machines like these ore unloaders and handles them easily and safely.

When steel says "SLOW"

When steel says "SLOW", unseen but vital control units such as Cutler-Hammer resistors mounted far up on the crane assume a major role in safety.

When steel says "STOP"

Dependable Cutler-Hammer magnetic brakes are the outstanding choice of mill engineers for the many jobs where steel often says "STOP" and means it.

By its very nature, steel-making cannot tolerate delays. But it is also true that steel-making is tough on equipment, punishes it as few other jobs do. Tie these two facts together and it is easy to see that steel sets a stiff pace at any time. Tie them together under today's maximum mill schedules and you have the toughest trials mill equipment has ever been asked to survive.

This situation puts much meaning into the fact that more steel mills are now buying more Cutler-Hammer Motor Control than ever before in history. Today's operations not only require the utmost dependability in motor control but provide the conditions which most clearly reveal it.

When you require motor control, always remember Cutler-Hammer dependability is extra value at no extra cost. Insist on Cutler-Hammer; experienced engineers everywhere do. , , , CUTLER-HAMMER, Inc., 1447 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto.

Cutler-Hammer Three-Star Motor Control sets three new cost-cutting standards; installs easier, works better and lasts longer. Featured by leading machinery builders. Stocked for your convenience by your Cutler-Hammer Distributor.

CUTLER-HAMMER
MOTOR CONTROL
C-H

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JULY, 1957

Plant Engineering

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The magazine that helps plant engineers with their everyday problems

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